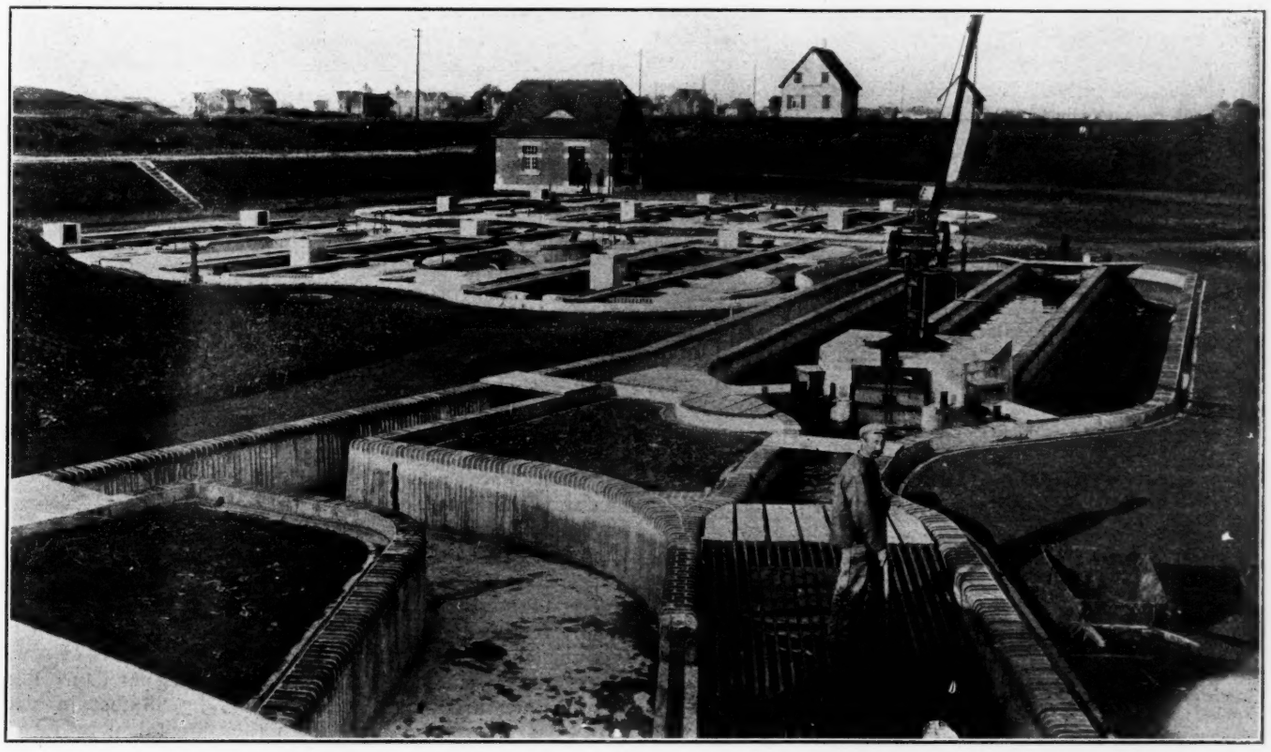
Municipal Journal

Volume XXXVI NEW YORK, APRIL 16, 1914. No. 16



PLANT AT HERNE, IN THE EMSCHER DISTRICT. ONE OF THE NEWEST AND BEST.

SEWAGE DISPOSAL IN THE RHINE PROVINCES

Conditions Found by the Author at Essen, Elberfeld, C ologne, Wiesbaden, Frankfort, and Dresden—Emscher Tanks—Sludge Lagoons and Tanks—Screens in Se veral Cities—Some Plants Objectionably Odoriferous.

By KENNETH ALLEN, Engineer, New York Metropolitan Sewerage Commission.

Sewage disposal in the Rhine cities aims at thorough clarification without attempting the final oxidizing processes found necessary in many inland cities on the smaller streams of Germany and especially in England. The works are, in general, carefully designed and operated by scientifically trained superintendents, and the results, both chemical and physical, are in many cases recorded. Such works are therefore in effect continuous testing stations from the results of which extensions or new works can be designed with greater intelligence.

The process employed is either fine screening or plain sedimentation or a combination of the two, and in each of these there is more to be learned here than anywhere else. The development has been carried further on rational lines and is of recent occurrence.

ESSEN.

The first of these cities visited was Essen. This is a good example of a prosperous German manufacturing town. Although containing over 300,000 inhabitants and growing very rapidly, it is not a place of great historic interest or one often visited by the ordinary tourist. It is well known, however, as the place where the great steel works of Krupp are located, whose resident employees numbered 37,800 in 1910, and is in the heart of a great coal producing region; but to the sanitary engineer it has for several years become associated with the work of Dr. Karl Imhoff, chief engineer of the sanitary district of the Emscher and, more recently, of the rivers Ruhr and Wupper.

It was with great interest that visits were paid to a number of the plants of the Emschergenossenschaft a few months ago. They have all been built since 1906,* are quite similar, constructed on carefully thought-out lines and operated under expert supervision. The Emscher tank is too well known now to require description here. At one or two of the older plants there was a small amount of odor in the immediate vicinity. At Recklinghausen-Nord in particular the entering sewage was quite offensive, due to trade effluents containing benzol, but the black sludge as drawn from the tanks had merely the odor of loam with a trace of rubber.

At Essen-Nord and Herne the works are quite new,

*The first of these, the Recklinghausen ,was put in service in February, 1907.

and as to construction and operation seemed to fill every requirement. At the former plant, which consists of 6 sets of tanks with 3 pits each, experiments were being carried on to obtain a more complete precipitation of the solids by the use of chemicals and then filtering the effluent through sand. If the results prove successful, the Emscher tank may be used in many situations where the ordinary brief period of settling of an hour or so would not be sufficient.

As it is, the Emscher tank is gradually being adopted in other parts of the empire, so that there are some 100 in operation. Its success in the Emscher district cannot be questioned. There, at comparatively small cost, especially for operation, serious and unsanitary nuisances have been effectively removed. The effluent, still fresh, generally passes by an open concrete-lined channel with good velocities to the Rhine.

Whether this method of disposing of a putrescible effluent will prove sufficient in the distant future is doubtful, but, in any event, the problem seems to be satisfactorily solved for the present in a most economical way.

ELBERFELD.

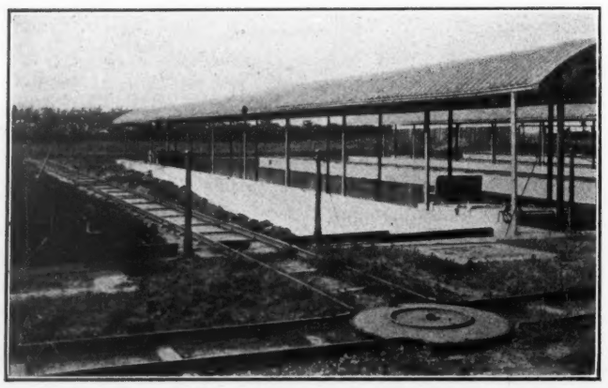
At the neighboring city of Elberfeld the works are reached by a ride on the interesting monorail "schwebebahn," in which, for most of the way, you find yourself swung over the river Wupper, whose bed the trestles of the railway span.

Here an Emscher tank is being operated by the side of 4 old settling tanks having 4 hopper bottoms in each. It is claimed that from 40 to 45 per cent of the total solids are removed by the latter, with but 35 minutes' detention. The dried sludge contains 26 per cent of fats, and a private company is making experiments looking to its recovery.

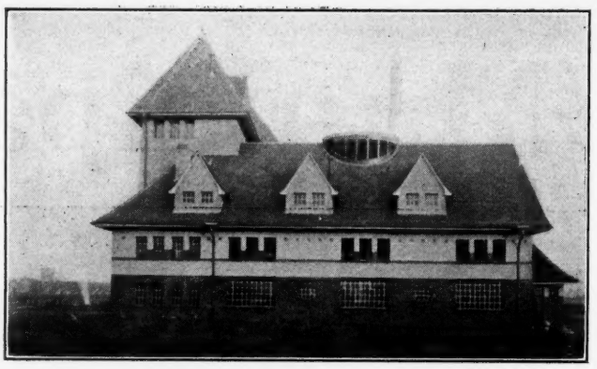
The 12 sludge lagoons, covering 3.6 acres, are of particular interest from the care with which they have been developed. The wet sludge is placed on these to a depth of 2 feet 8 inches, and after draining and drying for six months is reduced to half this thickness. It is then removed, further dried in dumps and used as a fertilizer or for filling in land. It must be admitted, however, that the odors in the vicinity of these works are very offensive, although the plant is so isolated that no serious objection is found.

The Emscher tank was put in operation in February, but by June it was far from "ripe," probably owing to the influence of certain wastes from dye and other works. Some odor was said to be caused by deposits on the baffles, but it was too early to judge what the results would be after maturing.

An interesting experiment was being carried on with the digestion of sludge in two separate chambers, 5 meters (16.4 feet) square and 5 meters deep. The sludge is taken from the old settling tanks, and as it decomposes the products of putrefaction are washed away by the admission of small quantities of water or fresh sewage. It will be interesting to compare the results obtained here with those obtained by John D. Watson at Birmingham and more recently by Dr. Imhoff with similar treatment.



SCREENING BINS, COLOGNE.
Built in Pairs, About 11 Ft. by 98 Ft. by 4.6 Ft. in Size, with Tracks Alternating with Wagon-Ways Between for Loading.



SEWAGE DISPOSAL PLANT AT FRANKFORT.

The sludge problem at Elberfeld has been a pressing one for some time, and it would seem that a really satisfactory solution will be found only by some radical change in the present method of disposal.

COLOGNE.

Perhaps the most elaborate experiments on the sedimentation of sewage that have been made up to the present time were made here a few years ago by Oberbaurat Steuernagel, but the works as now operated provide for screening only. The sewage amounts to 19 million gallons per day, and is derived from a population of 400,000. It is first passed through a 10 mm. (0.4-inch) screen and then through a 2½ mm. (0.1-inch) screen. This removes 16 cu. m. of screenings per day, which is equivalent to 1.1 cubic yards per million gallons of sewage, or 0.05 cubic yards per 1,000 persons per day. The screenings are placed in bins 11½ by 98 feet in size and 4½ feet deep, from which they are taken by farmers, who pay 5 cents per cubic yard for them. As might be expected, there was a strong odor about these bins and flies were abundant. Although the plant is carefully managed, it can hardly be said to come up to our ideas of a model plant to-day.

The effluent is taken by a pipe about 4 feet in diameter to a point in the river 480 feet from shore, where there is a depth of 10 feet.

WIESBADEN.

Wiesbaden is a city of 110,000 inhabitants, noted as being a most attractive watering place. Subsoil water is provided for by the sewer, and the storm overflows and other details are designed and constructed with great care. There is an entire absence of the offensive conditions associated with the interior of sewers. The clarification plant, near Bieberich, is less admirable, and it is expected to remodel this in the near future. Its present interest lies in the use of a very fine screen—1½ mm. perforations in a brass plate—but the design of this is not up-to-date, nor is the operation satisfactory.

FRANKFORT.

The Frankfort disposal plant is one of the best to be found. It is installed with a refuse incinerator in buildings that are not only appropriate but really attractive. Here, too, much experimental work has been and is being carried on. The result is a plant which is admirably adapted to the end sought.

The 420,000 inhabitants produce 25 million gallons of sewage per day. This passes through 1.8-inch screens, a grit chamber, 0.4-inch screens and then to a series of 14 covered settling tanks. Each tank contains two hoppers in the bottom with sludge effluents. The sludge

contains 90 per cent moisture. Formerly it was disposed of by spreading upon the land, but this caused such a nuisance that the practice was abandoned. It is now pumped to a battery of 8 Schaefer-ter Meer centrifugal dryers, which are installed in connection with the refuse incinerator. Each of these has a capacity of 5 cubic yards of wet sludge per hour, which is reduced to 60 per cent moisture. They are the result of much study and experimentation by the inventor, Stadtbauinspektor Shaefer, and are manufactured by a large machine works in Hanover, of which Herr ter Meer is the director.

The dewatered sludge is further dried by heat to 20 per cent moisture, when it has a calorific value of about 16,000 B.t.u., and is burned under the boilers of the plant. It is understood that experiments looking to the extraction of grease and utlizing the residue as fertilizer are now in progress.

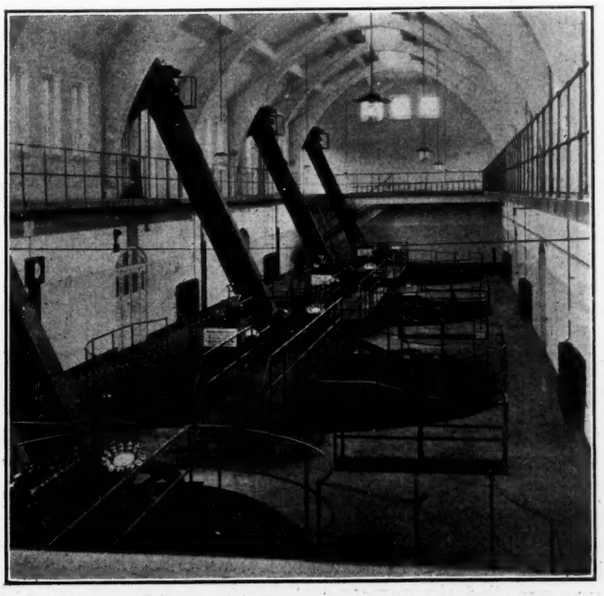
A small amount of odor was noticeable about the tanks, but, taken altogether, the plant was free from offensive conditions and the disposal was complete and efficiently performed. The cost of the plant was nearly $500,000.

DRESDEN.

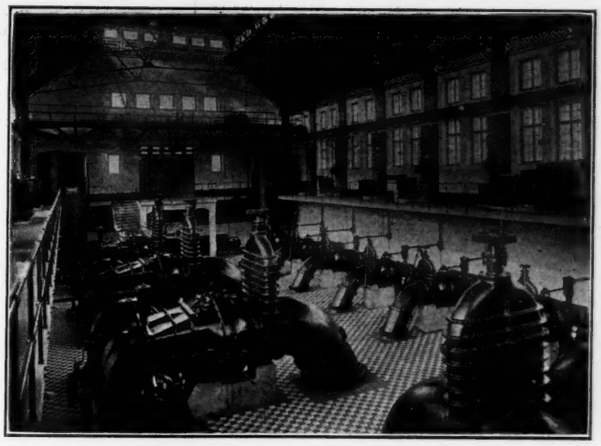
The Dresden disposal plant is also a model in its way and most attractive in appearance. Here, as at Cologne, Mainz and elsewhere, there is no tank treatment. The coarser solids are removed by coarse (2.6-inch) screens and a grit chamber, and the finer material by a battery of 4 Riensch screens, 26 feet 3 inches in diameter with slots .08-inch by 1.2-inch in size. The operation of these screens has been very satisfactory and free from offensive conditions, and since their installation they have been adopted for over fifty other towns on the continent.

The screenings at Dresden, as at Cologne, are stored until they are taken away by the neighboring farmers, who pay 5 cents a cubic yard for them. Meanwhile the odor about the plant is sometimes so strong as to be noticeable a quarter of a mile away. Fortunately, there are no houses to the leeward of the prevailing winds. The effluent flows to the Elbe, where it is discharged in 6½ feet of water.

The volume of sewage treated daily amounts to 25 million gallons, and is derived from a population of 500,000. From this the works remove 1 cubic yard of grit and about 1.3 cubic yards of coarse screenings and 21 cubic yards of fine screenings.



INTERIOR OF SCREENING ROOM, DRESDEN.



SEWAGE PUMPING STATION, DRESDEN.

In going over these works one is struck with the care and evident interest taken in their operation by the official in charge. In nearly all of them, improvements are in progress or being planned, and, although a high degree of purification is not attempted, the process employed is generally carried out effectively to the extent for which the plant is designed. A really satisfactory method of sludge disposal may be said to be the weakest point with most of them, but this matter is being studied and the next decade will probably see a considerable development, either in the digestion of sludge, as in the Emscher district, or by some method of utilization, as at Frankfort.

ELIMINATION OF PRIVY VAULTS

Methods Used in Five Large Cities to Enforce Vault Regulations—Property of Non-Residents—Poverty of Owners an Obstacle.

By ANDREW LINN BOSTWICK.*

The large municipality of to-day is almost certain to have enacted some sort of legislation looking toward the ultimate elimination of the privy vault. Such laws naturally follow the more complete development of a city's sewer and water systems.

Vault laws are of two main types. The less stringent regulations provide simply that where sewer connection is possible no new vaults may be constructed; the stricter laws provide, in addition to this, that all existing vaults must be abolished if sewer connection with the premises is possible.

Given the law, what methods are being employed in enforcing it? If a city passes an ordinance that makes illegal some ten or fifteen thousand vaults, just how have the authorities gone about carrying out its provisions? If the law says nothing at all about existing vaults, have the authorities found any way of getting rid of them? The actual experience of several large cities is given herewith.

Cincinnati.—Section 545 of the 1913 Building Code provides for the abolition of all vaults in cases where there is sewer connection with the premises, and prohibits the construction of any new vaults under these same conditions. Section 553 of the code provides that all premises must be connected with public sewers, if such premises abut on a street or alley that has a sewer. The Board of Health has also made regulations as to vaults. (June 5, 1912.)

The policy of the health authorities has been to con-

*Municipal Reference Librarian, St. Louis Public Library

demn all outside privy vaults, including those with overflow connection to the sewer. During 1911 about 1,500 vaults were done away with; in 1912, about 2,000; in 1913, about 3,000. There are still several thousand that can be eliminated.

Acting under the sections of the building code noted above, affidavits are issued and the cases tried in the criminal division of the Municipal Court. The judge orders the work done, and continues the case about 30 days. If the work has then been done, no penalty is assessed; if not, a small fine is imposed. In every case the work has eventually been performed, and no one in the court room has questioned the right of the health authorities to order it. Prosecutions have been made against attorneys and the more wealthy property owners. The results have been well advertised, with the result that the owners realize that the order must be complied with.

The "Vacation ordinance" (Building Code, 1913, sec. 745) is used in dealing with non-resident property owners with excellent results. This ordinance makes it unlawful to lease, or permit or continue the occupancy of any premises that are not free from unclean or unsanitary conditions. One condition described as unclean or unsanitary is the absence of toilet facilities as required by law. The Board of Health has power to cause the vacation of buildings where there is continued violation of this ordinance.

The chief obstacle in the enforcement of vault laws is the poverty of some of the owners. The city has no fund to use in proceeding to abate nuisances and charging the cost against the property. It is hoped to obtain such a fund, so that the city may do the work for poor people and allow them to pay for it in five yearly installments.

The city is divided into nine districts, with an inspector for each. House to house inspection is made as time permits. The inspectors have as one of their duties the supervision of vaults. It is reported that many new inspectors are needed, as nine is much too small a number for the work. The Housing Department co-operates with the health authorities. It also looks after tenements and the congested districts generally.

Baltimore.—Since the installation of the new sewerage system, vaults have been done away with on a great scale. The enabling act gives powers to the city to compel this work to be done. The system under which this vault elimination project is being carried out was described in a recent issue of Municipal Journal. The Health Commissioner advises that so far about 30,000 pieces of property have been connected with the sewers.

Detroit.—There does not appear to be much in the way of specific vault legislation in this city. When a vault becomes particularly offensive, it is ordered abolished. In 1910 and 1911 1,869 vaults were done away with.

Cleveland.—Section 1636 of the Revised Ordinances provides that there shall be no privy vaults in the city where sewer and water connection is available. The Health Department has very recently completed a census of yard water closets, vaults, etc. This census showed that there were 3,335 privy vaults in the city; 526 of these being used by more than one family. Of these vaults 1,141 were on sewered streets, and there are orders for removal pending in the case of 700 of this number, and in the case of the remaining 441 orders are now being issued. It is expected that many of these orders will not be complied with till 1915, although they call for abatement by April 1, 1914. This is due to the poverty of the tenants or owners of the property. The city contains also 3,983 sewer vaults. In 1912, 1,500 privies were abolished, and in 1913, 1,086. Many vaults have been done away with voluntarily. As to the sewer vaults, there has been greater difficulty. For ten years a law has been in force prohibiting the construction of sewer vaults—but as the law is not retroactive, the only way to get rid of existing sewer vaults is to prove that they are nuisances. It is expected that legislation will soon be enacted ordering the elimination of all sewer vaults. In 1912 and 1913 392 sewer vaults were abolished.

St. Louis.—The city of St. Louis contains somewhere in the neighborhood of 25,000 privy vaults, and several campaigns for their speedy elimination have been conducted. In 1909 an ordinance was passed prohibiting all vaults where sewer connection was possible, and forbidding the construction of any new vaults at all. This latter provision made the ordinance defective, in that it meant that vaults could not be built in outlying districts where there were no sewers. After about 1,500 notices were served, and about 75 cases taken into police court, the enforcement of the ordinance was suspended, at the instigation of the mayor. Early in 1913, after a new vault ordinance had failed of passage, the Board of Health again commenced operations under the 1909 ordinance. During the six months from May to October, 1913, 685 notices were served, most of them during the first month. The number of actual eliminations was considerable, although exact figures are not now available. With the advent of cold weather, the authorities began to have trouble. The procedure had been to compel the installation of outdoor anti-freezing closets; but since the cold weather there have been so many instances of closets freezing that the city authorities have again suspended activities in vault elimination. Despite the fact that there is a great deal of evidence in support of the anti-freezing closet system, it does not seem to have met with signal success in this instance. Further developments in the situation are expected in the near future.

MARSHALL, MICHIGAN, SEWER WORK.

During the summer of 1913 the city of Marshall, Michigan, built a district storm sewer costing about $13,000, the work being done under the supervision of the Smith & Boulay Company of Toledo, Ohio, with C. L. Rood as their engineer of construction. Mr. Rood furnishes the following information concerning this work:

The sewer consisted of lengths of 36-inch, 30-inch and 27-inch sewer, and the council decided to use segmental block for the largest size. They were not decided, however, as to whether to adopt this construction or vitrified pipe for the two smaller sizes, and consequently received bids on both, the blocks being the hollow vitrified blocks sold by the American Sewer Pipe Company. The bids received are given in the table.

An inspection of this table shows the estimation of each of four bidders concerning the difference in cost of segmental block and vitrified pipe sewers of 27-inch and 30-inch diameter, and also the additional cost called for by increases in depth of trench. The successful bidder added 25 cents per foot to the cost for an increase in depth from 6 to 8 feet, and 10 cents for an increase from 8 to 10 feet in the case of 27-inch sewer and 20 cents in the case of the 30-inch. For the increase from 6 to 8 feet the other contractors added 35, 30, 25, 20 and 18 cents respectively, while for the increase from 8 to 10 feet the additions were 30, 25 and 20 cents. As the prices for segmental block were in each case lower, this material was adopted for all of the sewers, and there was built 1,100 feet of 36-inch, 600 feet of 30-inch and 500 feet of 27-inch.

A force of seven men laid from 80 to 110 feet of 36-inch sewer per day, the distance depending chiefly upon whether the trenching gang furnished a sufficient amount of trench. Of this number two men laid the bottom five blocks; two men the top half, using a form, and three men supplied the cement and blocks to the others. The

work was carried on under almost ideal conditions. At one place the contractor had water to contend with, but a 6-inch drain tile laid a foot below the trench and carried for about 300 feet to an outlet kept this water down and permitted the blocks to be laid on a practically dry foundation.

At one part of the work, where the 30-inch sewer had to "buck a grade" for 600 feet, it was laid at a 0.11 per cent grade. As this was very flat, the bottom blocks were laid with a templet set by the engineer with a transit. After the first storm in which the sewer was used, Mr. Rood entered the sewer and found but two spots holding water, probably 5 feet long and from ⅛-inch to ¼-inch deep. He says that he has never been able to obtain such uniform grade with other types of sewers, no matter what pains he took, and believes that the possibility of obtaining such results is one of the advantages of this form of construction. While this is his only experience with this construction, he believes that his experience justifies him in considering that, compared with pipe sewers, it has the advantage of permitting better alignment, smoother interior, more easy handling in deep trenches, less cost in handling, either by rail or wagon, with less breakage, and the possibility of lowering it into the trench with a smaller number of men and with less danger to those in the trench. The disadvantages which he noted were that it was necessary to keep a considerable trench open ahead, and in close quarters, as at a manhole at the end of the sewer, the form used for building the arch of the sewer must be dispensed with and the blocks laid by hand, a fussy and unsatisfactory operation.

Bids Received for Sewers at Marshall, Mich.

	Bidder 1 Per Ft.	Bidder 2 Per Ft.	Bidder 3 Per Ft.	Bidder 4 Per Ft.
27-inch Seg. Block, cut 6 feet	$2.30	$2.70	$2.60	$2.63
27-inch Vit. S. Pipe, cut 6 feet	2.90	3.14	3.02	3.53
27-inch Seg. Block, cut 6-8 feet	2.55	3.05	2.90	2.81
27-inch Vit. S. Pipe, cut 6-8 feet	3.15	3.47	3.27	3.69
27-inch Seg. Block, cut 8-10 feet	2.65	3.35	3.15	3.01
27-inch Vit. S. Pipe, cut 8-10 feet	3.25	3.77	3.74	3.89
30-inch Seg. Block, cut 6 feet	2.65	3.05	2.70	2.73
30-inch Vit. S. Pipe, cut 6 feet	3.40	3.65	3.59	3.98
30-inch Seg. Block, cut 6-8 feet	2.85	3.35	3.00	2.91
30-inch Vit. S. Pipe, cut 6-8 feet	3.65	4.00	3.84	4.18
30-inch Seg. Block, cut 8-10 feet	3.05	3.65	3.25	3.11
30-inch Vit. S. Pipe, cut 8-10 feet	3.85	4.30	4.14	4.38
36-inch Seg. Block, cut 6-8 feet	3.31	3.95	4.27	3.37
36-inch Seg. Block, cut 8-10 feet	3.51	4.25	4.87	3.61

Bidder No. 1—The Globe Construction Co., Kalamazoo, Mich. Bidder No. 2—W. R. Caldwell, Detroit, Mich. Bidder No. 3—Edwards & Whaley, Milan, Mich. Bidder No. 4.—Asphalt Paving Co., Toledo, Ohio. Contract awarded to bidder No. 1.

OPERATION OF SEWAGE DISPOSAL PLANTS

PART III. CONTACT AND SPRINKLING FILTERS.

Periods for Each of the Four Phases—Resting Period Often Too Short—Filtering Medium and Drainage—Keeping Surface Open—Automatic Control Apparatus—How to Make Putrescibility Tests.

By FRANCIS E. DANIELS, A.M.*

In many localities the mere straining or clarification of sewage is insufficient for the prevention of nuisance or pollution of watercourses. It has been stated that the removal of only the suspended matters from a well mixed sewage eliminates but one-seventh of the organic impurities, while six-sevenths remain in solution.

CONTACT FILTERS.

During the past twelve or fourteen years contact filters have been used for the purpose of treating sewage liquids in America, and although they are now giving way to the more rapid sprinkling filters, over two dozen sewage treatment plants equipped with contact beds have been installed in the state of New Jersey alone. The disadvantages, such as area required, cost of maintenance, etc., and the advantages, such as low operating head, less danger of nuisance from odors and flies, are fully discussed in books on sewage disposal, and the advisability of building contact beds is always considered except in the cases of large installations.

The contact bed consists of an uncovered water-tight tank, or compartment, filled with broken stone, coke, slag, or coarse gravel, to which clarified sewage may be applied until the interstices are filled. After the sewage has stood in "contact" for a time it is withdrawn.

The process, therefore, has four phases, namely, rate of filling, time of contact, rate of emptying, and period of rest. For a long time the action of a contact bed was not properly understood, and no doubt many failures can be directly attributed to the fact that the relative importance of the phases mentioned have not always been recognized. The process is aerobic, and shutting off air by keeping the voids of the stone filled too long sets up anaerobic action, and defeats the purpose of the filter. After a bed has been in service for a time jelly-like films form upon the surfaces of the stones, and while the sewage is in contact with these films important changes in the liquids occur by a process known as adsorption. As this process is comparatively rapid, the bed is soon drained to allow the entrance of a plentiful supply of air to enable the organisms in the filter to continue the process of oxidation, and to regenerate their bio-chemical activities. This empty or resting phase is of prime importance, and sufficient time should always be allowed between fillings to enable the filter to become fully prepared for the next dose.

Although little is known of the actual bacterial types in a contact bed, there seem to be at least three reactions involved—hydrolysis and denitrification during the full period, and nitrification during the empty period.

In addition to the bio-chemical processes touched

*Director of Water and Sewerage Inspection, Bureau of Food, Drugs, Water and Sewerage, Board of Health of the State of New Jersey.

upon, there is also more or less sedimentation in a contact filter. This part of the work, however, is purely physical.

The effluent from a contact bed in good working order is fairly clear, and often non-putrescible. It is quite different from the liquids which entered the bed, although it is often passed through secondary contact filters or sand beds for further treatment. In this way sewage may be successfully handled at rates in the neighborhood of half a million gallons per acre per day.

It should hardly be necessary to mention that walls and foundations should be designed to withstand all pressures encountered; but the writer has at present under observation a filter which has to be emptied and repaired on account of a failure of its foundation. The walls should also be tested for leaks, and if there are any they should be repaired before the filter is put in commission. An apparently insignificant leak in a contact bed so interfered with the automatic control apparatus of one of our plants that it went practically out of business.

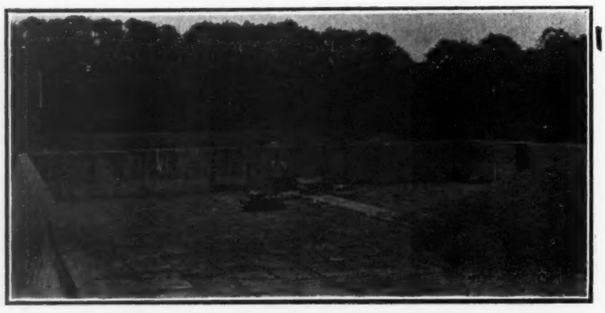
Good results have been obtained from using crushed stone, hard coke, furnace slag, or good hard clinker for a filtering medium. Stone is perhaps more durable and not so likely to disintegrate. Coke and clinker often give better results at first, but as such substances choke up more quickly, they have to be removed and cleaned sooner than stone.

On account of the greater surface area of the particles, fine filtering material gives better results than coarse; but as fine filters clog up much more quickly than coarse ones, the tendency now is toward the coarser material. A rather homogeneous mass consisting of particles about an inch and a half in diameter gives good results, although for secondary beds the material may be somewhat finer.

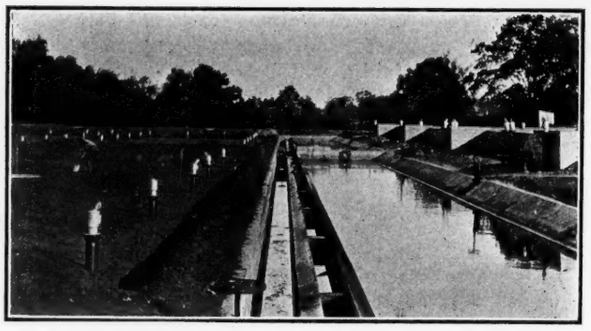
While four or five feet are considered good depths for the stone, beds are often made much shallower than these depths on account of lack of the necessary fall. Some of these shallow beds are doing good work.

The total volume of the interstices or voids in a new filter usually ranges between 40 and 50 per cent of the whole. This is reduced more or less quickly by one or more factors, such as settling together of the material, disintegration, growth of organic films, deposition of insoluble sewage substances, and impairment of drainage. As the percentage of voids during operation may be decreased to 20 or even 10 per cent, it is evident that good hard material of proper sizes should be selected to start with.

Since a bed should be emptied quickly after its period of contact, rapid drainage should be provided for. The best filters are now built with a false bottom of drain tile, supporting a layer of coarse stones, above which is the filtering material proper. This allows quick and complete drainage, prevents the formation of objectionable deposits of suspended matter, and aids in aeration.



FALSE FLOOR OF DRAIN TILE FOR CONTACT BED.



SETTLING BASINS FOR CONTACT EFFLUENT.

The sewage in the false bottom does not get much purification, especially in underfed beds, as it does not come in contact with the filtering media, but this objection is insignificant compared to the benefits derived from the better drainage and aeration.

The size of the outlet should be ample and so located that the bed drains clean after every dose.

The number and sizes of the units are important also. This is too often overlooked by designing engineers. The flow of sewage should be carefully measured or estimated, and the plant so designed that fluctuations or increases in flow can be properly taken care of. The beds should be so proportioned that the time of filling will not be excessive, and enough units provided so that each will receive at least two, but not more than four, fillings per day.

The successful management of a set of sewage contact filters is not so simple as many persons would have one believe. John D. Watson, who is in charge of the works at Birmingham, England, in a recent paper said: "However well a plant may be designed, if it is not well and skilfully managed it will become a nuisance and bring discredit on the engineer who designed it. The disposal of the liquid filth of a great community has an enormous potentiality for evil, and if town authorities believe it necessary to avert this by expending large sums of money on constructional work, it is their bonden duty to see that the plant is placed in the most competent hands. Local authorities are by no means sufficiently alive to this aspect of the question, with the result that too many works are left to the management of untrained men. Hitherto anybody has been deemed good enough to look after a sewage work, but the day has now come when the manager should be a highly trained technical expert if local authorities hope to get full value out of the sensitive entity which we call a bacteria bed."

While the above is quoted to emphasize one of the fundamentals of sewage disposal, it is by no means intended to discourage any conscientious person in charge of a sewage treatment plant. Let the plant attendant study the principles of his filters, all the local conditions involved, and the desired end to be obtained. He should work according to standard methods of procedure, but should always be on the lookout to make changes therefrom whenever results justify. His records should be so kept that they will demonstrate the advisability of any departure from the usual practice.

New contact beds require a certain time in which to ripen or become efficient. This may take days or even several weeks, depending upon the temperature or whatever else affects the growth of the bacterial films on the surface of the substances which are used to make up the filters. Until these growths are established there will be little or no purification, and during the ripening period it is well to throttle the outlet valves and empty

slowly because a very rapid or violent draining tends to retard the formation of the films.

The time of filling a contact bed will of course depend upon the relation of its capacity to the rate of flow of the incoming sewage. The actual filling time, however, should be reasonably short, say about an hour, but in many plants this time is often exceeded without serious consequences. Since the process of adsorption requires only a relatively short time, holding sewage in contact beds beyond this period tends to set up undesirable anaerobic conditions, which are detrimental to both the beds and the effluent.

When the bed is too large, partial filling may be adopted. This is either regulated by hand, or the automatic control apparatus is adjusted to change over the feed when the proper depth of fill has reached that determined upon. Some beds have partition walls, the gates in which can be opened or closed to adjust the capacity of bed to sewage flow. One or more beds are sometimes cut out, using only enough to give the proper rotation.

It must be borne in mind, however, that the main process of oxidation is done during the empty or resting period, so that the time of filling should not be cut down in order to cause too rapid rotation of beds, for this would interfere with proper aeration on account of shortening the periods of rest.

Formerly it was thought that at least two hours standing in contact were quite necessary. This time has now been considerably reduced. Some authorities recommend a holding for only fifteen or twenty minutes, while a few start to empty the beds as soon as full. In general, the writer prefers a standing-full period of about a half-hour, but there are many circumstances that may arise which will justify a slight change in this period.

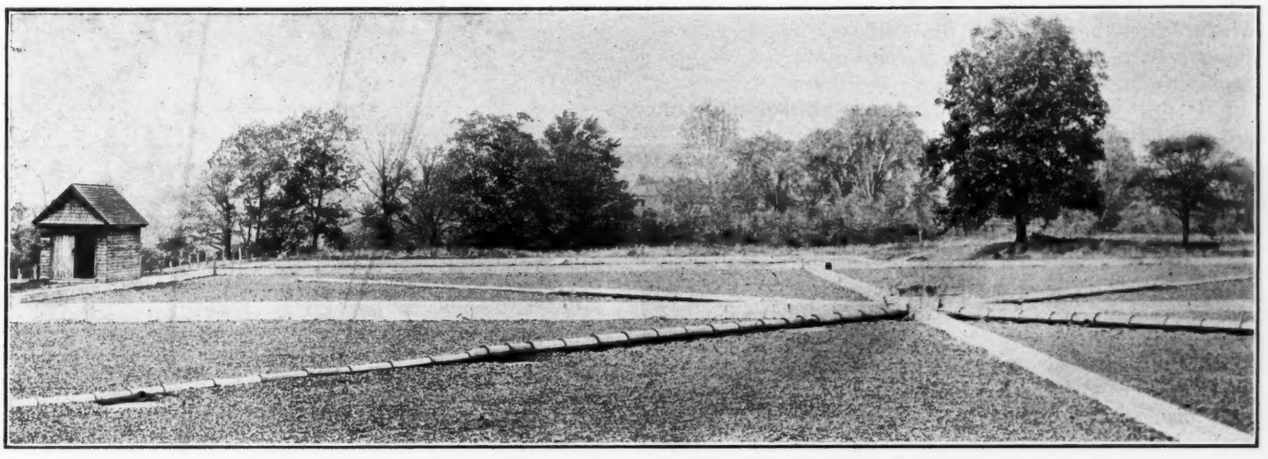
The time of emptying should be short and the draining should be complete. This is important, as by so doing aeration is aided and the accumulation of sediment is retarded, thereby maintaining the efficiency and prolonging the life of the bed.

At one of our plants the attendant changed the point of cut-off of the outlet siphons, which retained about seven inches of sewage in the contact beds. When this was discovered and the siphons repaired so that the beds drained completely, a large amount of collected sediment came out of the beds at the first discharge.

The importance of the period of rest is not always recognized. It is during this period that the bulk of the oxidation process is carried on, and the regeneration of the bio-chemical activities brought about. About two or three fillings per day is considered good practice, although sometimes this rule cannot be adhered to.

The regular rotation of the beds is important, and when the best routine is determined upon it should be carefully followed. The writer does not approve of the practice employed at some places, of storing sewage in one or more beds over night. It is difficult for beds so treated to recuperate.

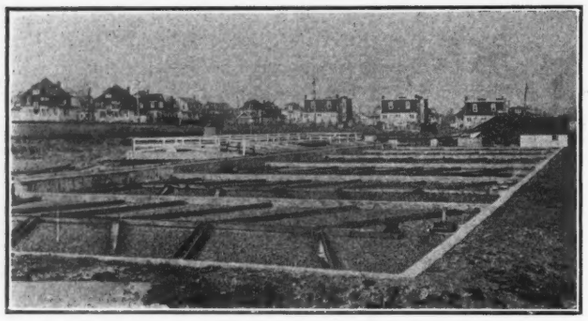
Notwithstanding the foregoing, it may be interesting to call attention to the performance of one of our contact bed plants. The four beds received the effluent from a septic tank through a pair of alternating siphons. The hand gates were changed at 6 A. M. and at 6 P. M., so that for twelve hours the discharge emptied into two beds and for the next twelve hours the discharge went into the other two beds. The outlet valves were partly closed so that the intermittent discharges of the siphons would fill up the beds considerably, but would not cause them to overflow. The beds were composed of comparatively fine slag and cinder, and for years gave an effluent which was clear and non-putrescible. As time went on the sewage flow so increased that the siphons would not break, so that a continuous flow entered the beds for a period of twelve hours. Even then the plant turned out a non-putrescible effluent for about eight hours after each changing of gates at the enormous mid-day rate of six million gallons per acre per day. For a single contact plant this seems somewhat remarkable.



CONTACT BEDS WITH HAND GATES AND TILE PIPE DISTRIBUTORS.

Although the underfeeding of contact filters has advantages, the writer prefers, when possible, to have the beds top fed, especially if the effluent is not discharged into settling basins. He does not attach much importance to the distribution of the dose over the top of the bed, nor does he approve of a layer of fine stone over the

CINDER BARRIERS ON CONTACT BEDS IN WINTER.

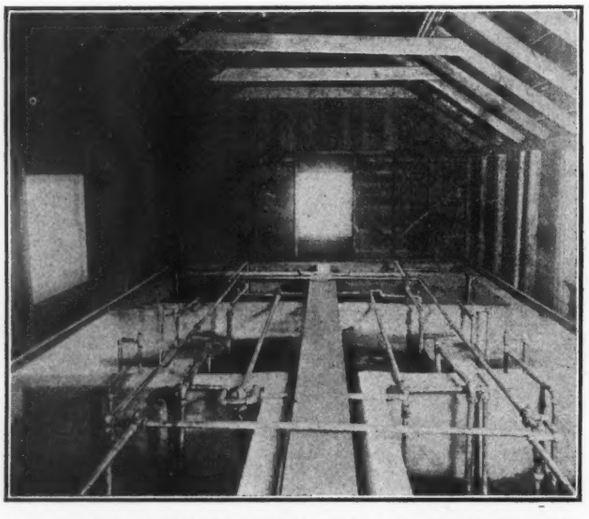


CONTACT BEDS WITH WOODEN TROUGH DISTRIBUTION.

coarser material. On the other hand, if there is much suspended matter in the influent the attendant can arrange a small crib or barrier of cinder or stone, which will strain out a very large proportion of the suspended matters. This arrangement, if given frequent attention, is easily cared for, and at some of our plants is producing good results. Elaborate systems of trough and tile distributors are unnecessary, and in the end do more harm than good.

It is often the misfortune of a conscientious street superintendent to be put in charge of a set of contact beds equipped with some form of automatic control apparatus. When he examines the outfit he sees a mass of pipes, valves, and what not. What he does not see is under water, stone or concrete. He should have an accurate drawing in a frame behind glass, hanging in the control house, but he hasn't; and there is probably no such drawing in existence. These forms of apparatus are often so changed in the setting that it is difficult for even an expert to explain the purpose of every part offhand. In addition to this drawing, the attendant should have posted a brief set of instructions in regard to the apparatus. This also applies more or less to the whole sewage plant. In an emergency it is often difficult to locate the right valve without a correct diagram. Many times the approved plans on file in the office of the central state authority are utterly worthless in this regard.

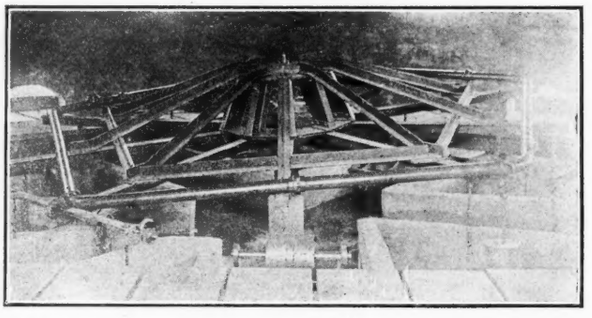
A discussion of the good and bad points of sewage control apparatus and of the many difficulties experienced with them would fill the pages of a book. The writer does not condemn them, but wants it clearly understood that they must be watched, and carefully adjusted if they get out of order. They cannot be trusted to run themselves. Worn parts must be replaced, air



AIR LOCK AUTOMATIC CONTROL APPARATUS FOR CONTACT BEDS.

leaks stopped, stoppages removed, metal parts painted, etc. These things are self-evident. But every little while the flow fails to change over, a siphon fails to hold, a feed fails to lock off, and many times it seems impossible to locate the cause. The best the attendant can then do is to adjust matters and trust to luck to find out the cause next time. Sometimes the apparatus is affected by circumstances over which the attendant has no control, such as storm, high tides, etc. At such times his personal attention is again demanded. The attendant must, therefore, find out in any way possible the purpose of every bell, pipe, valve, lever, float or bucket making up the control apparatus, and what to do in case of failure of operation. He must not wait until something happens to do this, but must be prepared to do the right thing in case of emergency. It is difficult to trace out pipes after everything is overflowing. But whenever possible he should determine and remove the cause of failure to operate. He should also study the limitations and possibilities of the control apparatus so as to be able to make adjustment in order to work the beds to the best possible advantage. A properly installed and looked after control apparatus will work quite satisfactorily; but unless it is in competent hands a plant is better off without it.

The surfaces of contact filters should be kept free



MECHANICAL AUTOMATIC CONTROL APPARATUS FOR CONTACT BEDS.

from weeds and soil formation. Everything which closes up the spaces between the stones cuts off the free access of air by so much. The same is true of fungous growths. Surfaces which remain wet soon become coated with fungus and blue-green algae. Whenever possible these should not be allowed to form, and if the surfaces are kept clean so that they will dry between doses these growths will be largely prevented. The writer has in some cases advised the cautious application of chloride of lime to keep down these objectionable formations.

When a bed becomes much overworked it is advantageous to cut it out and let it rest for a few weeks. This will give it a chance to recuperate and allow a good deal of the accumulated matter to dry up and unload.

Sooner or later, usually in about five or six years, depending upon local conditions, the filtering material of contact beds has to be removed and cleaned either by washing or by drying and screening. This is an expensive operation, and every effort should be made to keep the beds in good condition as long as possible. Every bit of suspended matter kept out of the beds means something towards increasing their life.

No sewage works is complete unless there is provision for reading the flow of its incoming sewage accurately and conveniently. Among other things, the attendant should keep daily records of the sewage flow and times required to fill the beds. By this means he can watch the decrease in capacity of each bed. These data will be useful as the beds begin to age. He should also note

any unusual appearance of the effluent so that it can be correlated with other results. More will be said later concerning tests and records, but it may be mentioned that every plant attendant should at least keep daily records of putrescibility tests. This test is easily performed by almost anyone. A sample of the effluent is taken in a glass-stoppered half pint bottle filled to overflowing. One or two drops of a one per cent solution of methylene blue are added and the stopper inserted by a twisting motion to avoid breaking the bottle and without allowing a bubble of air to remain. The bottle is then kept tightly stoppered at the ordinary temperature and observed every day. The blue color should remain fourteen days or more, but a color remaining five or six days indicates that considerable purification has been accomplished while the disappearance of the color in a day or two shows that something is decidedly wrong.

Two forms of methylene blue have been used and recommended. One is the usual laboratory stain, while the other is the zinc double salt used in dyeing. The latter is much stronger in color. Avoid using too much blue for fear of interfering with the test. Add only enough to give a good color, and record the first disappearance, as the color sometimes returns.

We have in New Jersey a plant which has filters that have been called both contact beds and trickling filters. They are composed of rather fine gravel, and receive doses from siphons which discharge into a system of distributing troughs. The effluent from the primary beds passes through similar secondary beds, and its detention in the beds is very slight. When operated within its capacity, this plant gives good results. Such a plant forms a connecting link between contact beds and sprinkling filters, and, as in the case of sprinkling filters, even distribution of the dose is of prime importance.

(*To be continued.*)

AKRON'S SEWAGE DISPOSAL TESTS

Equipment of Experimental Station and Results of Tests —Imhoff, Dortmund and Septic Tanks—Sprinkling and Contract Filters—Industrial Wastes.

Akron, Ohio, has a population estimated at about 75,000. The chief industries are rubber, sewer pipe and cereals. The sewerage is largely upon the separate plan, but defective sewer joints, large amounts of ground water and the connection of rain water leaders to the sewers cause the sewage to be quite highly diluted. The sewage is discharged into the little Cuyahoga river, the extreme dry weather flow of which just below Akron is about 36 million gallons a day—sufficient to satisfactorily dilute the sewage of only about 11,000 population. Purification of the sewage is therefore very desirable.

In the fall of 1910 the city engaged E. G. Bradbury to report upon these conditions, and in December he advised that a series of tests of the applicability of the various standard methods of sewage treatment to the purification of Akron's sewage be undertaken. The purpose of these tests was to determine whether the trade wastes could be handled best with the sewage or independently; to select the most efficient and economical process of preliminary and final treatment; to study the sludge problem and devise the best means for its solution; to investigate the diluting capacity of the river with reference to sewage in various stages of purification; to determine the suitability of local materials as filtering media, and to discover if possible a means of prevention of aerial nuisance from the use of sprinkling filters.

Ten thousand dollars was appropriated to cover the entire cost of carrying out such a series of tests, and Harry B. Hommon was placed in charge. Having in mind the size of the appropriation, only those devices were installed which had been successfully used in sewage purification. A complete chemical survey was made of the wastes from the various industries, principally the rubber mills and sewer pipe factories; also a study of the present condition of the little Cuyahoga river and the Ohio canal, both of which flow through the city and receive much of the wastes from the factories. The people of Akron felt that the manufacturers were imposing a burden on them by admitting wastes into the sewers which would require a very expensive purification system, but the tests proved that no special purification methods would be required because of this.

Less than one year was occupied by the tests, including the construction of the plant, and "it was demonstrated," says Mr. Hommon, "that cities of moderate size having unusual trade wastes can carry out experimental studies without materially increasing the total cost of purification and at the same time give the designing engineer a complete knowledge of the work that will be required of the plant he designs." The total cost of plant and tests was $9,500, and when the station had been dismantled, apparatus and chemicals of an estimated value of $300 were turned over to the city laboratory. While these tests were made during the first nine months of 1912, various causes delayed the publication of the results until early this year.

THE EQUIPMENT.

The construction of the testing station was begun on November 5, 1911, and was completed on December 26 with the exception of the filters and settling basins, and these were all in operation by June 13. In general the equipment consisted of a grit chamber, Imhoff tank, Dortmund tank, septic tank, 3 sprinkling filters and settling basins, 2 contact filters and a sludge tank. A pump transmitted about 50,000 gallons of sewage a day to the station, although part of this was not passed through the appliances, but was wasted in maintaining a head in the orifice tanks.

The station occupied less than a quarter of an acre of land. The general plan is shown herewith. The pumping equipment comprised a 1½-inch centrifugal pump directly connected to a 2½ horse-power gas engine. The suction pipe, enlarged to 4 inches, was furnished with a swivel elbow in the 42-inch sewer outfall from which the sewage used was drawn; leading from which elbow was a 4-foot nipple which was supported by a chain so that the opening of the suction pipe was ordinarily maintained at a point slightly below mid depth of the sewage stream. None of the sewage tested was screened, but it was passed through a strainer in the end of the suction pipe which had quarter-inch perforations.

All the sewage tested was pumped into a grit chamber which consisted of a wooden flume 6 inches wide, 8 inches deep and 5 feet 11 inches long, baffled and provided with an outlet weir. From here the sewage flowed continuously into 3 orifice boxes, one for each of three clarification tanks. The excess pumpage flowed over a weir, thus maintaining a head of 1 foot on the orifices. Each orifice box was 9 inches wide, 3 feet long and 15 inches deep, and was provided with a brass orifice plate having an opening of fixed and known diameter which was computed to give the desired flow under the 1 foot head.

Clarification Tanks.—The three clarification or preparatory tanks were of the Imhoff, Dortmund and septic types. The Imhoff was of wood, circular, 8 feet in diam-

eter and 15 feet deep. An inverted cone bottom 4 feet high was constructed of concrete. Sewage flowed first into a curved gutter which extended the full width of the sedimentation chamber. This chamber was former of wooden partitions 4 feet 6 inches high, at the bottom of which were other partitions sloping toward each other at an angle of 45 degrees, one passing by the other and leaving a slot opening of 2 inches. The total depth of the tank below the slot was 7 feet. The tank was baffled by a vertical partition in the center of the sedimentation chamber which extended 5 feet below the flow line. Sewage left the sedimentation chamber by another curved gutter extending across the full width of the same. The total capacity of the tank was 4,693 gallons and that of the sedimentation compartment was 2,030 gallons.

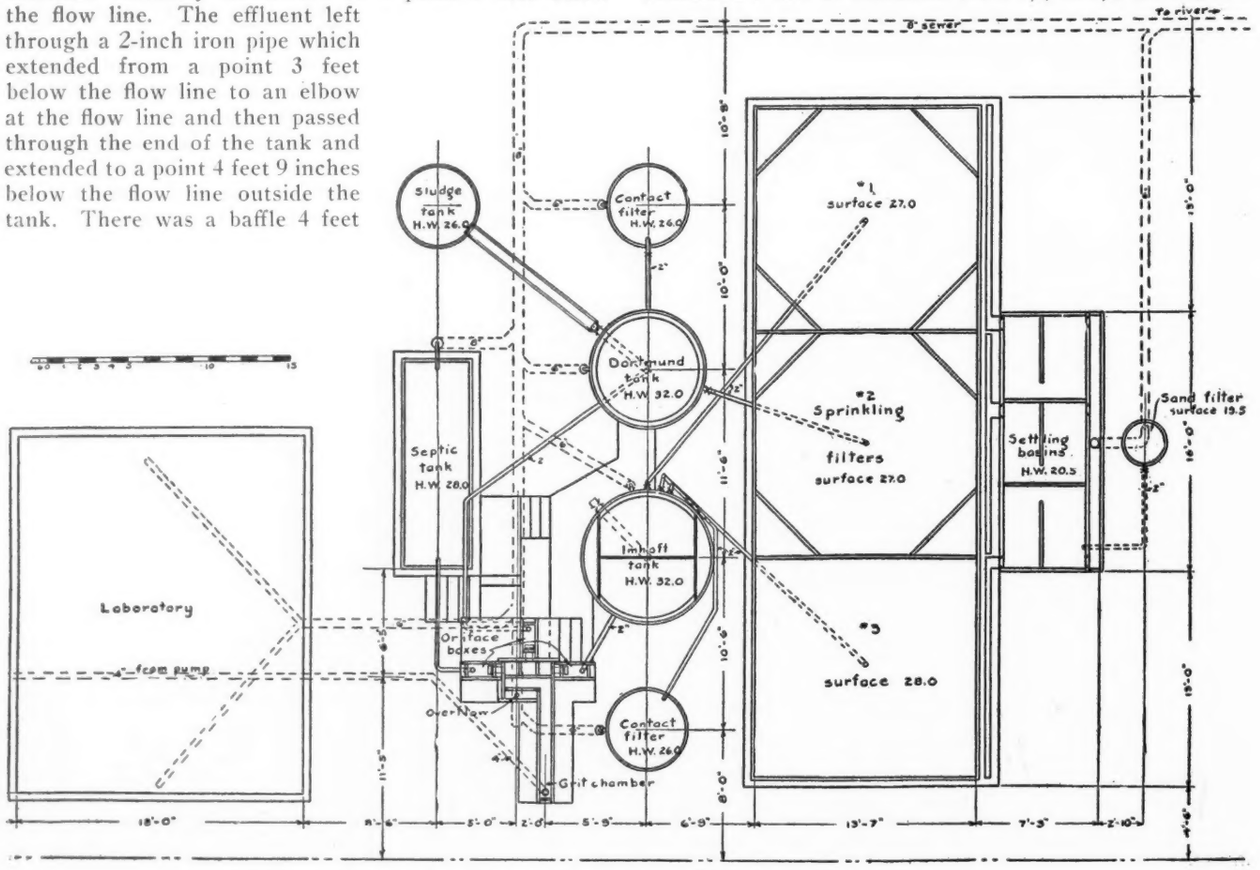
The Dortmund tank was of cypress, 7 feet in diameter and 10 feet 6 inches deep. At a point 6 feet 6 inches below the top there was formed of wood plastered with concrete a conical compartment 4 feet deep which extended to within 6 inches of the bottom of the sludge compartment and served for the withdrawal of the sludge. A sludge pipe passed out of the tank at such a point that the hydrostatic pressure was 4 feet 5 inches. Sewage entered the tank through a 2-inch pipe which extended downward in the centre to 5 feet below the flow line. The effluent left the tank through holes in the bottom of a galvanized iron trough which extended entirely around the periphery; from which trough three pipes led, two to the filters and one to the drain. The capacity of the tank was 2,017 gallons, and the capacity above the cone was 1,641 gallons.

The septic tank was rectangular, 4 feet wide, 12 feet 6 inches long, 9 feet 2 inches deep, constructed of wood. It was 4 inches deeper at the outlet than at the inlet end, and there was an 8-inch shear gate for removing sludge. Sewage was applied through a 2-inch iron pipe which extended vertically downward to a point 3 feet below the flow line. The effluent left through a 2-inch iron pipe which extended from a point 3 feet below the flow line to an elbow at the flow line and then passed through the end of the tank and extended to a point 4 feet 9 inches below the flow line outside the tank. There was a baffle 4 feet from the inlet and another 4 feet from the outlet end of the tank, the first extending 4 feet below the flow line and the second 4 feet upward from the bottom. The tank was not covered. Its capacity to the flow line was 3,032 gallons.

Measurements of the rate of flow through the preparatory tanks were made at frequent intervals by lowering the water level and noting the time required to refill to the flow line. The progressive accumulation of sludge was determined by frequent measurements by the use of the graduated rod, described in our issue of February 19. These measurements were made at a sufficient number of points in each tank to obtain average measurements over the entire bottom of the tank.

Sprinkling Filtcrs.—Three sprinkling filters were constructed of cypress nailed to studding, erected upon a concrete base 4 inches thick. On this base 4x4's were laid spaced 2 inches on centres, the spaces being filled with concrete which came to the top of the 4x4's at the back of the filter and sloped to nothing at the outlet ends. At right angles to the 4x4's were laid 2x4's spaced 6 inches on centers, and held in place by toe-nailing and by blocks set between the timbers. Upon this base were carefully placed field stones 4 inches in diameter and on them the filtering material to the desired depth. These filter boxes were 13 feet 7 inches across and two of them had wooden partitions across the corners making the available space hexagonal in shape, and giving an available area of 745 square feet or .0033 of an acre, assuming the filter as circular. The actual area of the third tank was 184 square feet, but as the whole was dosed with a circular nozzle the effective area was considered the same as in the other filters.

Filter number 1 contained 5 feet of sewer pipe broken to small pieces from 1¾ to 2½ inches; filter number 2 contained 5 feet of limestone from 1¾ to 2½ inches, and



PLAN OF AKRON SEWAGE TESTING STATION.

filter number 3 originally contained limestone to a depth of 5 feet, but on August 9 this was increased to 6 feet by adding more stone of the same size. Sewage was applied to each filter through a 2-inch iron pipe in the center of the filter and distributed by a Taylor nozzle of circular type, the head on which was ordinarily 5 feet.

Each sprinkling filter had an individual settling basin 5 feet square and 4 feet 3 inches deep, into which the effluent entered after flowing over a weir. In each of these basins was a vertical baffle which extended to the bottom of the tank and to within 18 inches of the side. The settled effluent left the basin over a weir and was carried by a drain to the river. The working capacity of each basin was 700 gallons.

Contact Filtcrs.—The contact filters consisted of wooden tanks each 5 feet in diameter and 5 feet 8 inches deep, filled with filtered material to an average depth of 5 feet; number 1 containing broken sewer pipe from 1¾ to 2½ inches, and number 2, ½ to ¾-inch limestone. Drainage to an outlet was effected by placing a sloping layer of concrete in the bottom of each tank. Sewage was applied to the filters through a 2-inch iron pipe and drawn off through a collecting channel at the bottom. Regulation was afforded by a gate valve attached to the 2-inch iron pipe, which was screwed into the side of the tank. The area of each contact filter was 19.63 square feet.

Sludge Tank.—For the study of sludge digestion there was provided a wooden tank 5 feet in diameter and 6 feet deep, at the bottom of which was a 2-inch iron pipe controlled by a valve. Sludge from the Imhoff and Dortmund tanks was brought to this through wooden chutes.

CLARIFICATION TANK RESULTS.

Measurements showed that the average period of flow in the Imhoff tank was 2.3 hours. During the eight and a half months during which it was operated there passed through it 4,700,000 gallons of sewage, which contained an average of 238 parts per million of suspended matter. The maximum, minimum and average removals of suspended matter accomplished by the tank were 61.9, 26.8 and 48.4 per cent respectively. The minimum results obtained were in July and were attributable to the clogging of the slot by suspended matter, which was not noted for several days. In view of this it would seem probable that for average conditions the Imhoff tank removed 50 per cent of the suspended matters.

After about six months' operation, pronounced fermentation developed in the sludge of the Imhoff tank, which was disclosed by a copious ebullition of gas, the formation of a slight scum and the black color of the sewage in the gas compartments. The peculiar construction of these tanks, however, prevented any effect of this upon the sedimentation. Under normal operating conditions no offensive odors were appreciable a short distance from the tank. The effluent frequently contained nitrites and quite frequently dissolved oxygen also; this being largely due to the ground water mingled with the sewage.

While the tank was not operated long enough to obtain normal data regarding sludge, it was found when the plant was dismantled that the major part of the sludge was very homogeneous, entirely black in color and contained numerous small gas bubbles and had a slight odor of tar. It flowed readily through a 4-inch sludge pipe and no difficulty was experienced in removing it in this way without dilution with water. Analysis showed the sludge to contain only 74 per cent water and to have a specific gravity of 1.12. Computed to dry solids the quantity of sludge actually found in the tank was 1.7 tons. The most important feature noted was that the Imhoff sludge was more compacted, as indicated by the smaller percentage of water, and was lower in nitrogen and higher in fats than the sludge from the septic tank.

After the Dortmund tank had been operated for several months it was found that the normal elevation of the sludge deposit was 6 feet below the surface of the water, or 12 inches below the inlet pipe. Considering the volume of the tank below this 6-foot level as the sedimentation compartment, the capacity of this was 1,641 gallons. The average period of flow in the tank was 2.87 hours. There were removed by this tank 21.8 per cent of the organic nitrogen and 9.3 per cent of the carbonaceous matter as indicated by the oxygen consumed. There was a slight increase in free ammonia, which was becoming pronounced with the advent of warmer weather, and during the latter part of the tests a marked fermentation developed in the sludge.

During the first five months of operation this tank proved most efficient in the removal of suspended matter, removing about 58 per cent up to the time when sludge decomposition became pronounced. After this, however, the removal of suspended matter decreased until during September there was more suspended matter in the effluent than in the applied sewage. The fermentation was much greater than in either the Imhoff or septic tank, which fact may probably be attributed to the peculiar design of the tank whereby unstable organic matters in a crude state are continuously in contact with the sludge. This suggests that facilities should be provided in these tanks for the frequent withdrawal of sludge and ample sludge beds or other means for disposing of it.

During the tests no objectionable odors were noted in the vicinity of this tank. Dissolved oxygen was generally present in the applied sewage and was materially reduced in passing through the tank. At the end of the test the sludge removed from the Dortmund tank was an entirely black homogeneous deposit with a peculiar odor of tar. It contained fewer gas bubbles than the Imhoff sludge and considerable difficulty was experienced in causing it to flow through the sludge pipe, it being necessary to loosen it up before it would flow readily. It contained 74 per cent water.

The rate of application of sewage to the septic tank gave a period of flow of 7.4 hours, no allowance being made for the volume occupied by the sludge in computing this. The average removal of suspended matter was 63.9 per cent and the maximum was 72 per cent; the latter being obtained in March, when considerable quantities of sand and clay were carried by the sewage, and again in June on account of concentration. The minimum occurred in September, when the efficiency of the tank considered as a settling basin was markedly decreased owing to active fermentation in the sludge. The tank was started in operation on January 1 and there were no evidences of fermentation in the sludge after four months' operation, and this did not become especially pronounced until the warm weather of July. No appreciable quantities of scum were formed upon the surface of the tank during eight and a half months of operation, although occasionally there would be a few patches of light floating matter which soon disappeared. No objectionable odors were noted. Up to the time septic action became established, the effluent generally contained small quantities of dissolved oxygen, at times as much as 20 per cent saturation; but during the latter part of the tests, when the oxygen in the applied sewage averaged 18 per cent of saturation, none was found in the effluent. The sludge contained 78 per cent water at the end of the test.

Comparing the three tanks, it was found that the septic tank removed much more suspended matter than

either of the others, although the Dortmund tank gave better results up to the time when septic action became pronounced. Making allowance for irregularities in operation during July, the average per cent removed by the several tanks were 50 by the Imhoff, 46.7 by the Dortmund and 63.9 by the septic tank. The test showed that during the summer months it would be necessary to remove sludge from the Dortmund or septic tanks at frequent intervals to prevent large masses from rising to the surface, escaping with the effluent and clogging the filters. In the majority of cases sludge must be held in a tank to await favorable weather conditions, otherwise drawing it on to the sludge beds would create very objectionable conditions. This advantage of the Imhof tank, and the fact that its sludge was more readily drained, more thoroughly digested and less offensive than that from either of the others caused the Imhoff tank to be recommended by Mr. Hommon. The tests showed that the period of flow in the upper compartment of these tanks under Akron conditions may be about 2½ hours, and that provision should be made for an average net accumulation of about 2.3 tons of wet sludge per million gallons.

SPRINKLING FILTER RESULTS.

Two of the sprinkling filters received the effluent from the Imhoff tank and the other that from the Dortmund tank. The filters were operated continuously, except when the entire station was shut down for repairs or some other reason, being actually in operation about 90 per cent of the period covered by the tests. The net rates of operation of the three filters were about two million gallons per acre per day. The three filters removed respectively in September 59.4, 57.1 and 60.5 per cent of the oxygen consumed; 62.9, 67.6 and 65.7 per cent of the organic nitrogen, and 84.6, 85.1 and 87.9 per cent of the suspended matter. No unloading of the filters took place during the tests, apparently because they were not operated long enough. There was no marked septicization in the effluents from any of the preparatory devices and consequently no nuisance from odors from the sprinkling filters.

With the advent of warm weather there developed on the surfaces of the three sprinkling filters large numbers of small insects belonging to the fly family. These pests have been noted frequently at large sprinkling filter plants and belong to a genus known as psychoda. The flies are very small and can easily pass through an ordinary window screen, but do not fly far from the surface of the filters. In some places they have been very annoying to the operators and special screens are necessary to keep them out of dwellings and other structures located near the plant. It is probable that these flies, together with worms and other infusoriae, assist largely in the conversion of the organic matters of the applied sewage to relatively stable humus. Frequently large masses of fly larvae were noted on the underside of the top stones of the filters.

Throughout the test there was more or less clogging of the nozzles, largely due to pieces of rubber so fine as to escape sedimentation. Clogging was less serious with Imhoff effluent than that from the Dortmund tank. The nozzle receiving the latter finally clogged so frequently that a screen of ordinary wire window screen cloth was placed around the outlet pipe from the tank and successfully prevented further clogging. It was recommended that these shreds of rubber be removed from the sewage at the mills where they are discharged, rather than at the municipal purification works, to avoid the necessity of passing the sewage of the entire city through a relatively fine screen.

On examining the filters at the end of the tests, an accumulation of gray suspended matter on the stones was found for 18 inches downward, while it extended for 30 inches in the filter containing broken sewer pipe. Little deposit was found upon the vitrified convex surfaces of the broken pipe, but quite heavy deposits where the pieces rested with concave surfaces upward; and these latter also afforded better shelter for flies than the broken stone, and at the approach of a storm many more flies were observed entering this filter than the stone filter. A study of the results indicated that the stone and broken pipe gave practically equal results as regards efficiency, but with respect to operation there appeared to be considerable advantage in favor of the broken stone. The results obtained with the filter 6 feet deep were much superior to those from the same filter when only 5 feet deep, as well as from the other 5-foot filter.

CONTACT FILTERS.

When first constructed, the contact filter containing broken sewer pipe showed 46 per cent of interstices, and that containing stone showed 38 per cent. In operating, the period of filling was made about four hours, of standing full, four hours, and that of emptying, four hours, after which the filter stood empty for aeration for twelve hours. The rates of treatment were therefore 740,000 and 615,000 gallons per acre per twenty-four hours. The filters were operated for three months, but did not afford satisfactory purification. Clogging was largely in evidence, aeration was imperfect, and stable effluents were not obtained.

EFFECT OF WASTES.

The dry weather flow of the city was about 11 million gallons, of which it was estimated that about one-half was water other than sewage proper, mostly unfiltered ground water. Wastes from rubber and salt works amounting to about 600,000 gallons per day were being discharged into the sewer, and other works might connect with the sewers. It was believed, however, that only the two mentioned and the paper mill produced wastes which were likely to interfere with ordinary sewage purification processes. The liquid wastes from each of these was studied, samples being taken every twenty minutes through ten hours of operation, and these samples were carefully analyzed. The wastes from the rubber mills were found to be much stronger than the others. Those from the salt works carried little suspended matter, but large quantities of sodium chloride, the average quantity of chloride in two samples being 58,000 parts per million. Although the wastes from the rubber mills were quite strong, the actual amount contributed to the sewage was insufficient to increase materially the suspended matter in the normal sewage. It did not appear from the operation of the disposal plant that any of these wastes had any injurious effect upon the operation of any parts thereof, with the possible exception of the sprinkling filters, which were subject to occasional clogging by small pieces of rubber.

PLAN RECOMMENDED.

It was concluded as a result of these tests that sewage of the city of Akron could be purified satisfactorily by a plant comprising—1, a small grit chamber for the removal of sand; 2—Imhoff tanks of a capacity equivalent to a period of flow of about 2½ hours, and sludge beds corresponding to an average net accumulation of about 1.4 tons of dry solids per million gallons; 3—sprinkling filters operated at the rate of two million gallons per acre in 24 hours, and small settling basins of about two hours' flow, with ample means for the withdrawal of sludge; 4—adequate means for the disposal of an accumulation in the settling basins of about 0.5 ton of dry solid matter per million gallons.

Municipal Journal

Published Weekly at
50 Union Square (Fourth Ave. and 17th St.), New York
By Municipal Journal and Engineer, Inc.
Telephone, 2805 Stuyvesant, New York
Western Office 608 S. Dearborn Street, Chicago

S. W. HUME, President
J. T. MORRIS, Treas. and Mgr. A. PRESCOTT FOLWELL, Secretary
C. A. DICKENS, Western Manager
A. PRESCOTT FOLWELL, Editor
F. E. PUFFER, Assistant Editor

Subscription Rates

United States and possessions, Mexico, Cuba.....$3.00 per year
All other countries..... 4.00 per year
Entered as second-class matter, January 3, 1906, at the Post Office at New York, N. Y., under the Act of Congress of March 3, 1879.

CHANGE OF ADDRESS

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Contributions suitable for this paper either in the form of special articles or of letters discussing municipal matters, are invited and paid for. Subscribers desiring information concerning municipal matters are requested to call upon MUNICIPAL JOURNAL, which has unusual facilities for furnishing the same, and will do so gladly and without cost.

APRIL 16, 1914.

CONTENTS

Sewage Disposal at Columbus.

In his report on the operation last year of the sewage disposal plant at Columbus, Ohio, the superintendent, Jerry O'Shaughnessy, states "this department was unable to fully accomplish its purpose because it was handicapped by insufficient funds, inadequate sewage pumping and treatment facilities, and by pollution of the river above the sewage treatment works." The report states that the river was seriously polluted throughout the year with raw sewage and trade waste; that foul odors, gas production and floating sludge were present at times all the way from the relief outlet of the intercepting sewer above the disposal plant to about fifteen miles below the plant. The gasification was found to be caused by deposits of sludge in the river. Some of the sludge undoubtedly came from sewage and trade waste which was discharged directly into the river; but it seems to us almost unquestionable that some came from the disposal plant itself. Previous to the year 1913, all of the sludge collected in the septic tanks or in the sprinkling filter settling tanks had been flushed out into the river. This was supposed to be done during times of flood; but if we are correctly informed, on many occasions sludge reached the river when the flow was little, if any, greater than ordinary. Moreover, when the river is in "flood" the sewage is not passed through the plant at all but is discharged into the river. (This was done during 143 days last year, so that the word "flood" must be quite comprehensive as used in the report.)

These causes must, we think, be responsible to a considerable extent for the deposits in the river. But even assuming that they are not, and that such deposits are due entirely to sewage and trade waste which are not brought to the disposal plant, it seems to us that the plant is partly responsible for the offensive conditions in that the degree of purification of the sewage is such as to reduce the power of the river to oxidize the organic matter in the deposits. We find, for instance, that the stability value of the final effluent for 1913 averaged 67, which is considerably below what is ordinarily thought to be a satisfactorily stable effluent, and was the lowest average of any year of the five since the plant went into operation. Examinations of the river water were made at frequent intervals throughout the year, and averaging all of these we find that a little above the relief outlet of the east side interceptor the water averaged 64 per cent of oxygen saturation; eight-tenths of a mile below this outlet, which is also about half a mile above the sewage disposal plant, this had fallen to 41 per cent. What it was immediately below the outlet of the disposal plant is not stated, but seven miles below it was only 32 per cent, while eleven miles below it had increased to 50 per cent, and it would seem very probable that immediately below the disposal plant the per cent of saturation was much less than 32. When we turn to an analysis of the results of the treatment, we find that the final effluent contained 65 parts of suspended matter, which is 50 per cent more than during the first year of operation, and that the stability value has steadily decreased during the five years of operation. These figures, of course, apply only to the days when the treatment works were being operated, which was only 222 days in the year, or about 61 per cent of the time. During the remaining 39 per cent, or more than one-third of the year, all the sewage was being discharged into the river untreated.

Much complaint has been made about the foul condition of the Scioto river as it passes through the city, and apparently the city has only itself to blame. It is recognized that the plant is not large enough; it was known when it was first built that it would very soon need to be enlarged. There is also need of intercepting more of the impurities which now find their way into the river, and bringing them to this or some other treatment plant or plants. The superintendent states that plans are being made for accomplishing both of these ends, and that the help and co-operation of all city officials will be needed. We believe he could with justice have said that the plant has been most unjustly criticised for a condition of affairs for which it is not responsible, in that it was known several years ago that this condition would arise if provision was not made for extensions and improvements to the plant and to the sewer system.

Providing for Growth in Municipal Plants.

Should an engineer, in designing a municipal plant, make it adequate in capacity for several years to come, and therefore unnecessarily large for the present? Or should he keep at a minimum the construction and interest charges by adapting it to the immediate requirements only, although providing for expansion as needed? The latter would seem to be the logical choice in most cases, but for one fact—that city councils and even boards of private corporations are too apt to refuse appropriations for extensions when needed, and thus the service very quickly would become inadequate. Even if the engineer's report emphasizes the fact that additions must soon be made to the plant proposed, this report is entirely forgotten in a year and the demand for more money for the plant gives a shock to council and taxpayers.

This tendency is seen in all directions. Pumping plants are overworked until even the cooperation of the reserve pumps barely suffices to supply the maximum consumption. Lamp after lamp is added to the load on an electric light plant until the frequency of interruptions to service compels the addition of new units to the generating plant. The city engineer figures that a penetration bituminous pavement, given frequent attention, will be more economical for a certain residence street than a more "permanent" one; but the anticipated attention is denied it, and he is blamed for the poor result.

Every city in this country, and consequently every public utility for serving it, is expected to grow, and this growth must be recognized in the plans in some way. In a sewer or water main capacity for 25 to 50 years in advance is provided because this is generally most economical. But the same does not hold true with machinery. If worked far below its capacity its efficiency is low; if divided into too small units its cost of both installation and operation is high; and there is the additional danger of obsolescence if too prolonged a service be contemplated.

The problem in each case requires for its solution the application of common sense to an uncommon degree. What we wish to emphasize is the desirability of taking into account the tendency of councils to feel that a plant should not need any considerable extensions or changes for at least five or ten years after the issuing of bonds to build it; and the advisability of therefore designing it for that far ahead, in spite of the less economy which would be secured.

GRANITE BLOCK PAVEMENTS.

We publish the following abstract from a letter just received, in justice to the company referred to and also for the information of paving officials.

Editor Municipal Journal,
50 Union Square, New York City.

Dear Sir:—

We have to-day noticed in your issue of the 2d instant, an article on granite block pavement. It has interested us to quite an extent principally for the reason of the inaccuracy of the statement as to the names of the concerns who are in a position to furnish granite paving to the city of New York and the surrounding cities. Would say that in the year 1913 we furnished 14 million blocks, two-thirds of them going into what may be called the "New York market," that is, for the city of New York itself and others nearby.*** Yours truly,

HILDRETH GRANITE COMPANY,
By H. V. Hildreth, General Manager.

As stated in the article in the April 2d issue, to which Mr. Hildreth refers, the list of quarries, as well as all other matters therein, was quoted from a report just published by the Bureau of Highways of Manhattan, New York City. Although this report has just been published, it was written a year ago, and it is probable that up to that time the Hildreth Granite Company had not furnished any blocks to New York City.

As to the kind of granite which is desirable for paving blocks, Mr. Hildreth apparently agrees with the New York officials, as the following gives his ideas on the subject:

A block the structure of which is composed of such ingredients that the surface is gritty and will continue to wear so as not to polish, thus becoming so smooth that there is very little restance when anything comes in contact with it. Horses slip and fall; the wheels of vehicles spin around without advancing, the friction being far too little.

Nature has put granite formations in all parts of the world. These formations, however, vary as to their make-up in about every locality and many of them are not suitable for street paving blocks, especially those which are hard and brittle and which will take a fine polish, as is desirable in monumental work. Also a granite which is soft and easily crumbled is not desirable.

The granite which is the best adapted for street work is the one which is fine grained; free from an abundance of quartz, and of such composition that its surface is gritty both when first taken from the quarry and as it wears. A granite of this description is necessarily a free working stone; one from which the blocks can be produced in the best possible shape, that is, with comparatively smooth and regular tops, beds and joints.

The material used for a filler in the joints, whether it be tar, pitch or cement, more readily adheres to a granite of this description and the bond is far more firm and secure.

A street laid with granite blocks of the kind described above, and where a cement filler is used, wears even and the surface after many years of use presents an appearance as smooth as a floor.

FERTILIZING VALUE OF SLUDGE.

No Process Known for Utilizing It at a Net Profit—Fat Objectionable and Fertilizing Constituents Not Readily Assimilable.

This is a subject which has been discussed and concerning which experiments and inventions have been made for more than twenty-five years; and it is probable that it will continue to receive attention from sanitarians and promoters. There is a certain amount of value in sewage sludge; the problem is to extract enough material of fertilizing or other value and in a sufficiently serviceable form to more than pay for the cost of the process. In a bulletin of the Massachusetts State Board of Health, H. W. Clark, chemist to the board, discusses the subject at length, and from this we make the following summary; giving first the conclusions entire, and then an abstract of the data upon which they are based. (Articles upon this subject will be found in Municipal Journal for February 16, April 20, and August 3, 1910; January 4 and June 14, 1913; March 28, April 18, and May 9, 1912, and April 3, 1913.)

CONCLUSIONS.

It is evident (1) that the total amount of fertilizing and fatty matters in each 1,000 gallons of representative American sewage is not worth above 6 or 8 cents. Of this, about half is represented by the ammonia in solution, and there is no method by which this material can be utilized except by application of the sewage to land. All experience, covering many years with hundreds of well-operated sewage farms ranging in size from a few acres to the vast 39,000-acre farm at Berlin, Germany, has shown that only under the most favorable conditions can the return from these farms be made to pay operating expenses, and an instance is yet to be cited where these returns pay both the cost of operation and interest on the capital invested. The exceptions, perhaps, to this are certain tracts or farms in regions of low rainfall and where the sewage is valuable as a liquid, that is, for real irrigating purposes. The Wolverhampton farm quoted in this report is undoubtedly a representative English farm as regards good management and cost of operation, and at this farm the actual total cost of sewage treatment is $49 per million gallons.

(2) Much of the valuable fertilizing and fatty constituents in sewage is found in the matters in suspension. Average American sewage contains, perhaps, about 2,400 pounds of sedimentable matter in a million gallons, and the nitrogen, fatty matters, etc., in this 2,400 pounds of sludge are worth, approximately, $15 or $18. In order, however, to reclaim this valuable material, the sludge must be dried, pressed and also subjected to a process for the separation of grease from the fertilizing constituents in the remaining body of the sludge. Only by this separation can the grease become an article of commerce and the sludge of real agricultural value. This fact is well established by long experience and many investigations. When the fatty matters are separated by any

known process, this procedure is costly. Only in a few places as yet is such separation attempted as a commercial enterprise, and the profitableness of the works at these places is as yet doubtful. When the sludge is freed, or practically freed, from fatty matters it consists of a large weight of inert mineral and organic matter mixed with a comparatively small weight of fertilizing matter, hence the cost of carriage is great even when it is well dried. It has also been well proved that the nitrogen, phosphoric acid, etc., present are generally in a less assimilable form than the same bodies in ordinary commercial fertilizers. The sludge has value, however, and as the processes of drying, pressing and fat separation are improved, and also as nitrogen advances in price, as seems inevitable, sewage sludge will become of greater agricultural value than it is at present, especially as the basis of a fertilizer enriched by the addition of potash, phosphates, etc.

DATA AND ILLUSTRATIONS.

The sewage of Lawrence, Mass., which is used in the experimental station of the Board of Health, showed the following amounts and values per thousand gallons of sewage: nitrogen as free ammonia, 0.27 pounds, 4.3 cents; kjeldahl nitrogen, .09 pound, 0.9 cent; P_2O_5, .08 pound, 0.4 cent; K_2O, .12 pound, 0.5 cent; giving a total theoretical value of 6.1 cents per thousand gallons. Each thousand gallons also contained about one-quarter of a pound of fatty matters worth about three-quarters of a cent. From this it appears that two-thirds or more of the valuable constituents are represented by ammonia in solution. The total value of fertilizing materials is about $61 per million gallons, and that of the fatty matters about $7.50.

Sewage from ten representative European cities averaged 50 per cent more sludge than the above; but the fertilizing constituents were found in connection with large amounts of inert organic and mineral matters and much fatty matter, the presence of which lessens the mineral value of the sludge.

The British Royal Commission stated in the conclusion of its 1908 report that where land can be bought for $500 an acre or less, land treatment is probably, other things being equal, the cheapest method of purification. The cost of sewage treatment at eight farms reported upon by the Commission was found to vary from $6 to about $77 per million gallons of sewage.

The largest and probably the best managed sewage farms in the world are those at Paris and Berlin, the former covering more than 15,000 acres and the latter more than 39,000. Certain French authorities believe that the Paris farms will be ultimately abandoned, and Professor Dunbar thinks that at Berlin artificial filters will take the place of the sewage farms. The total operating cost of the latter in 1906 was $700,000, and the receipts $750,000; but if interest on the capital sum expended on the farms at 3½ per cent be added, we find the receipts amounting to $17.60 per million gallons of sewage, while the cost totaled $26.20. "The only regions where sewage farming can at present probably always be carried on at a profit are arid regions, such as found in India and the western part of the United States, and in such regions the profit is due really to the value that the sewage has as a liquid rather than to its value as a fertilizer; that is, in these regions irrigation is a necessary adjunct to crop raising."

Dr. Fowler says that the sewage farm at Wolverhampton is one of the best managed in England. The cost of operating this for the year ending March 31, 1908, was $26,000 more than the profits from the farm; or including interest and sinking fund the net cost was about $56,000. The average rate of filtration here was about eight million gallons per acre daily, and the cost, including operation, interest and sinking fund was $49 per million gallons.

The British Royal Commission on sewage disposal, after many years' work and study, concluded that while sludge has a fertilizing value, the amount of the fertilizing constituents present is relatively very small compared with the gross mass of the sludge, and consequently the value of the sludge as a fertilizer depends to a large extent upon the cost of carriage. Their experiments showed, also, that not only do these fertilizing constituents act much more slowly than those present in ordinary artificial fertilizers, but also that unit for unit the nitrogen and phosphoric acid present are of less value than the commercial fertilizers, as they are less valuable for plant food. Moreover, there is danger of clogging the soil if too large an amount of sludge is used.

The Commission conducted several experiments, using sludge and fertilizing chemicals containing equivalent amounts of nitrogen and phosphoric acid, and applied these to two separate areas, growing the same crop on each of these and also upon a plot of the same land untreated. In one of these turnips grown upon sludge treated land produced 900 pounds per acre less than on the untreated land, while the chemical fertilizer increased the yield 4½ tons per acre. In another case wheat and corn were tried similarly, and it was found that sludge had no effect upon the number of ears or their size, but did produce longer straw; the weight of the straw, however, was only from 10 to 20 per cent greater than in the case of untreated soil, while the artificial fertilizer with equivalent amounts of fertilizing constituents produced from 40 to 50 per cent increase. In this experiment it was found that the sludges which were dryest and contained the least lime gave much poorer results than those with more moisture and lime. In another experiment with grass raising, the first season was cold and dry and the results were not considered fair; but the same land was used again untreated the following season, and, combining the results of the two seasons, the total yield of the sludge-treated land was from 5 to 20 per cent less than that of the untreated soil, while the land fertilized with chemical fertilizers gave from 6 to 20 per cent greater yields. The sludges with the highest nitrogen content gave the lowest results, while those with much lower nitrogen and higher lime gave much higher results.

Concerning the extracting of grease, Mr. Clark describes at some length a process employed at Bradford, England, the sewage of which contains much waste from woolen factories which brings an unusual amount of grease to it; the sewage being treated with acid and the sludge pressed in 128 sludge pressers. There are also 16 grease vats, each capable of purifying six tons of grease. It is stated that a part, at least, of the sludge is sold at three shillings per ton at the works, and in 1904 the plant gave a revenue from grease sold of $29,300, but the cost of acid employed in the process was $59,500. The works are not operated, however, with the expectation of financial profit, but to keep the grease and sludge from entering the river. The use of acid for obtaining increased amounts of fat and nitrogen from the sewage was tried at the Lawrence experiment station, and it was found that by the use of acid costing $.15, additional nitrogen and fats were obtained worth about $7.25. Moreover, these represented the actual values of materials in the sludge, but if they are to be rendered of material value, the fatty matter must be separated from the remainder of the sludge at great additional expense.

The WEEK'S NEWS

Concrete Roads Being Extensively Constructed—How Commission Will Proceed in Preventing Lakes Pollution—Omaha's Water Plant Increases Earnings by $36,000—Lighting Situation in Philadelphia May Effect Municipal Plant—White Motor Busses in Tacoma—Urge Training Schools for City Managers—Oakland's (Cal.) New City Hall.

ROADS AND PAVEMENTS

Concrete Roads Extensively Constructed in Maryland.

Hagerstown, Md.—Chairman O. E. Weller of the State Roads Commission has said that of the contracts let thus far 75 per cent, or probably more, were for concrete roads in preference to macadam. The complaint has been general that macadam roads cannot withstand the wear and tear of heavy automobile traffic. Mr. Weller asserted that with the increased experience of contractors in making concrete roads, the bids for such construction were becoming lower and in some instances bids for concrete were less than for macadam roads. A statement recently issued shows the extensive work in prospect: "With a loan of $6,200,000, of which $5,000,000 is for the counties and $1,200,000 for Baltimore city, the State Roads Commission expects to be able to fill in all the main gaps of the system throughout the State, to build a large proportion of the secondary gaps, to pay for the work already done in counties in excess of their allotments, to finish that under construction, to build through certain incorporated towns, to erect some necessary bridges, to finish the Washington boulevard, etc. This will add about 500 to 550 miles of new road to the system, making a total of, say, 1,000 to 1,050 miles either completed or largely constructed, by the end of 1915, which will make a connected, intra-county system."

Government to Build Model Road.

Mt. Sterling, Ky., April 7.—Contractors have failed to make a bid within the appropriations made by the government so that it will be obliged to build the model road between this city and Sharpsburg. The government authorities were so well pleased with the ready assistance given by the citizens along the route and the liberality of the two counties that they believe it is their duty to build the road. Equipment is now being assembled to be shipped here, and all arrangements are being made to begin active work on construction by May 1. It is estimated by the government that the road will cost approximately $3,400 a mile.

Paving Contractors Get Cheaper Labor.

Meadville, Pa.—The cost of labor in paving work has decreased greatly when compared with the high prices of last summer. Then, for instance, many contractors found it difficult to get men at $2.50, working nine hours a day. This spring a large number of laborers are willing to work from one dollar to fifty cents cheaper for ten hours a day. A contributary cause of the present cheapness in labor is found in the fact that many railroads have discharged their men and others have greatly reduced the wage scale. Paving contractors in Meadville are rather glad that paving work was delayed last summer and the contracts not let until this spring.

Will Spend Millions for Grade Crossing Elimination.

Philadelphia, Pa.—City and railroad officials are proceeding with their preparations to start work on the removal of grade crossings in South Philadelphia, which Director Cooke declares is the one of the several Greater Philadelphia projects that will not be affected should the Supreme Court finally confirm its original decree declaring the loan for $8,600,000, which contains $1,800,000 grade crossing removals, to be invalid. The city has $1,000,000 now available, and the directors of the Pennsylvania Railroad, when authorizing the signing of the agreement, appropriated a like sum. As soon as the Baltimore & Ohio Railroad officials take similar action there will be $3,000,000, all that it is possible to expend in one year, available for use.

City Gets Portable Asphalt Plant on Approval.

Syracuse, N. Y.—A portable asphalt plant has been received on approval by Commissioner of Public Works, A. Van Wagner, and will be set up within a few days. The plant is taken on trial, and if it proves satisfactory it will be purchased without competitive bidding under the permission granted by the Common Council. As soon as the weather is warm enough to dry out the asphalt pavements, the department will be ready to start repairs. A roller is expected to be delivered within a few days, completing the equipment. The asphalt has been purchased and arrangements made for supplying sand and other necessary materials.

Street Oiling by Private Contract.

Richmond, Ind.—The board of public works practically has decided not to have street oiling done this year under the direct supervision of the city. Next year, however, the board hopes it will be possible for the city to do all the oiling. "The board is considering a plan to have all streets oiled this year under private contract, the parties circulating the petition to be responsible to the contractors for payments," said Mr. McMinn of the board. "Under this plan the city would thoroughly clean all streets before they were oiled, which would be a great saving to the contractors and in appreciation of which the contractors would be expected to oil all street intersections without cost to the city or property owners."

International Competition for Road Improvement.

Turin, Italy.—The Turin and Naples County Councils, together with other borough administrations, have proclaimed an international competition for engines and methods representing an improvement in the maintenace of macadamized roads, to be held in Naples in 1915 in connection with the third National Road Meeting. The competition will repeat that held in Turin in 1911, which proved unsuccessful for lack of exhibitors. Applications are ordered to send before June 30, 1914, to the Organizing Committee of the International Competition for Road Maintenance, Touring Club, Milan, Italy.

Colorado to Utah Highway Being Completed.

Craig, Colo.—Moffat county will within a few weeks be able to boast the first through and traversible highway from northern Colorado into Utah. The gigantic job of installing twenty-two bridges and building a splendid highway from Craig to the K ranch on the border undertaken last fall by Moffat county, is now assuming definite shape, and the indications are that it will be one of the best pieces of road work in the state when completed. The highway will open a market to western Colorado products heretofore closed, owing to the difficulty of reaching it, and as a result, will mean much to this section—in fact, it will begin a new era of prosperity for northwestern Colorado in general.

Chicago Will Try Concrete Roads.

Chicago, Ill.—Five of the most important roads leading out of Chicago are to be improved with concrete construction as part of the first year's work under the new Illinois State-aid law. The National Automobile Chamber of Commerce has been informed that twenty miles of concrete paving, divided between heavy teaming and market roads radiating in all directions, will be built. The estimated cost of the new highways is $12,000 a mile. A formal beginning of State-aid work is to be made on April 20 when

work will start on the Elgin-Aurora road. This stretch is to be surfaced with concrete 18 feet wide and 8½ inches thick at the center. A distance of 17 miles along the Fox river will come under the State-aid provisions.

Convict Labor System Called Wasteful.

Miami, Ariz.—The present system of road construction in the state and counties is wasteful, according to State Engineer L. Cobb and the contract system ought to be given preference. "Working prison labor under guard," said Mr. Cobb, "the state cannot get as much efficiency as by letting contracts for the same work. Not alone that, but the cost is greater under the present system. It is natural for the prisoner or the man working by the day to spend as much time on the job as he can; in other words, to do as perfect a job as he is capable of. The result may be excellent, but it is too limited in its extent. On the other hand, the contractor is naturally in a hurry to get through. He will do the work up to the required standard and let it go at that. I do not mean, when I say let contracts, to let them without providing for proper supervision over the work. In the first place, I believe that every contract let should contain a minimum wage scale agreement, which, if not adhered to by the contractor, would serve to forfeit the agreement."

Highway Association Formed.

Lake Charles, La.—The Gulf and Interoceanic Highway Association was formally organized by 150 delegates, chiefly from gulf coast states, here recently, when a constitution was adopted and Joseph O. Schwartz, of New Orleans, was elected president. Other officers elected are Walter Gex, Bay St. Louis, Miss., general vice president; John B. Kent, Lake Charles, La., secretary, and John Legier, Jr., New Orleans, treasurer. Vice presidents were elected to represent the states which the highway is planned to traverse from California, Arizona and New Mexico eastward along the gulf and up the Atlantic coast. The highway is expected to touch New York, Atlanta, Birmingham, Montgomery, Mobile, New Orleans and continue westward to San Diego. Another meeting will be held in New Orleans in about three months to perfect final details of organization.

Good Roads Notes.

Ames, Ia.—Consolidated schools are being asked by the Iowa Highway Commission to set aside at an early date a Good Roads day. No uniform date is to be observed but rather a consecutive series of dates for the schools in each section of the state. The commission is preparing a good roads exhibit for these days. A representative of the educational department of the commission will be present to explain the law and deliver an illustrated lecture on good roads and good roads building. In addition it is suggested that the children make a preliminary study of the new road law and that a good roads program consisting of recitations and papers by the children themselves be made a feature of the day.

Columbus, Ga.—The good roads movement recently launched in Columbus appears to be spreading out into all sections of Georgia and direct results are beginning to show up. There is already a movement on foot in Columbus, Buena Vista and Ellaville which will give a highway between these three cities, on the route proposed by the Savannah Auto club. This plan will be put in force as soon as possible. The citizens of Buena Vista and Ellaville have agreed to raise any amount of money necessary to assure the building of this route, which would call for the building of about nine miles of road through the northern part of Chattahoochee county. The people of Chattahoochee along this route are also pulling for this road and will raise money.

SEWERAGE AND SANITATION

State-Wide Campaign to Fight Typhoid.

Richmond, Va.,—The continued cool weather and the prospect of a late spring offer advantages for a state-wide campaign against typhoid fever, according to a circular of the State Board of Health. The board declares that its statistics and those of the various city health departments in Virginia show that the worst typhoid years are those in which an early spring is followed by a hot summer, while the best records have been achieved in those seasons when the spring was late or the summer unusually mild. Charts prepared by the board and published in its annual reports from time to time show a marked coincidence in the temperature curves and those of typhoid morbidity. The reason for this, in the opinion of health authorities, is that an early spring gives the flies that survive the winter an oportunity of multiplying and scattering the germs of typhoid more quickly and more widely. On the other hand, it is argued that if the spring be late, the early "crop" of flies is reduced. "The citizen who wishes to protect his home from flies," says the board, "will take advantage of this and will utilize the late spring to protect himself and his premises. A sanitary water supply and a sanitary outhouse are absolutely necessary, for without these waterborne and fly-carried typhoid can spread and infect the whole household."

Plan Procedure in Preventing Great Lakes Pollution.

Chicago, Ill.—The international joint commission on boundary waters between the United States and Canada has adopted a plan of procedure in determining remedies to prevent pollution of the lake waters. The plan follows:

1. Obtaining of opinions of leading sanitary engineers on questions of general policy and consultation with the sanitary engineers and sanitarians to be employed by the commission.
2. Hearings to enable all interested parties to present views and facts as to what remedies they would advise and are capable of installing and maintaining, the hearings to include any expert testimony submitted.
3. The collection of all available knowledge and data bearing on the most approved methods of water purification and sewage treatment.
4. Formulation of advisable requirements for each locality, according to local conditions and necessities as shown to exist as the result of the investigation by the commission and the report of its sanitary experts on the pollution of the boundary waters.

"Two questions were submitted to the commission by the government," said James A. Tawney, of Minnesota, the chairman, "one was the fact of pollution. We have completed an inquiry into this phase and found that waters of the lake are grossly polluted in many places. Our next work will be to study methods of correcting this condition and to lay our conclusions before the government."

Marsh Fill and Sewer Building Make Dangerous Condition

Brooklyn, N. Y.—As a result of constructing a storm sewer in Avenue U and the filling in of marshes, water has forced itself back under ground and effected a series of hummocks in the vicinity of Eighty-sixth street and Van

Courtesy Brooklyn Daily Eagle.
WATER BACKED UP INTO MEADOWS.

Sicklen street. In building the storm sewer large volumes of spring water were encountered. The water was pumped into Van Sicklen street sewer. It flowed under Van Sicklen street to the marshes, where it is supposed to be carried away by the natural drain into Coney Island Creek. The marshes, however, have been clogged by the fill and the bottom of the creek has been raised so that the drainage area is really obliterated. An underground lake has, therefore, been formed. In some places, as shown in the illus-

tration, water has backed up into yards of houses and ruined many truck gardens. The water being stagnant and foul smelling, menaces the health of residents nearby.

WATER SUPPLY

Large Increase in Earnings of Municipal Plant.

Omaha, Neb.—That the efficiency and economy practiced under public ownership of the Omaha water plant resulted in an increase in net earnings of over $36,000 during the last six months of 1913, compared with the same period in 1912, is stated in the report of C. S. McConnell. Mr. McConnell recently finished his examination of the books and accounts of the Metropolitan water district, and declared the accounting system accurate and efficient. He said he found that although the receipts during the six months ending December 31, 1913, increased $26,000 over the receipts of the last half of the year 1912, the expenses decreased over $10,000. Mr. McConnell's report states that during the eighteen months of public ownership the gross earnings of the water district were $1,312,115.62, and the total expenses, $886,683.54, leaving a surplus over all expenses of $425,432.08, notwithstanding the reduction in rates. In 1911, under private management, the expenses of the plant serving about 23,000 consumers, were $266,000, exclusive of interest and legal expenses. In 1913, under public management, serving over 25,000 consumers the expenses, exclusive of interest and legal expenses, totaled only $249,000, a difference of $17,000 a year. The accountant also reported that $400,000 of the water district bonds have been purchased with the excess earnings and that $200,000 is in the sinking fund for the retirement of bonds, and $140,000 in the depreciation fund.

Would Condemn All Wells.

Bridgeport, Conn.—"Condemn every well within the city limits," is the way in which Commissioners E. A. Lambert and Frank W. Stevens of the Board of Health expressed their views of one means whereby the illness and death rate of the city can be reduced. At a special meeting of the Board of Health the two commissioners, one a sanitary engineer and the other a physician, declared that from their studies of the subject, every well in Bridgeport should be condemned. "The danger of an epidemic is great," they declared, and in neighborhoods where contagious diseases exist a nearby well would prove the breeding place for millions of germs. This action may take place before the present board goes out of existence. Already all four members are prejudiced against wells and are taking steps to get rid of the more dangerous ones.

Newark's Water Department Shows Large Profit.

Newark, N. J.—A net profit of $99,182 for the year ending December 31, 1913, as contrasted with a loss of $17,428.83 at the end of the previous year, is shown in the financial statement of the city's water department, submitted by President C. L. Kraemer to the Board of Works. The statement of earnings and expenditures during the year follows: Net sales of water and miscellaneous operating income, $1,281,849.03; deduct operating expense accounts, $409,211.40, and interest and sinking fund payments on funded debt, $782,673.53, and add miscellaneous revenues $9,217.

Install Air Compressor for 2,450-Foot Well.

Leigh, Neb.—An air compressor, installed at a cost of $15,000, is now lifting water from a well 2,450 feet deep. By means of the compressor water will be forced from the deep well and stored into surface wells, and again, from the latter wells it will be raised into the air-pressure storage tanks. John Metzer has the contract for installing the machinery.

STREET LIGHTING AND POWER

Must Lower Rates or May Build Municipal Plant.

Philadelphia, Pa.—Director Cooke, of the Department of Public Works, virtually served notice on the Philadelphia Electric Company that it will be obliged to appear before the public utilities commission as a defendant unless it materially reduces its charges for street lighting. The director strongly intimated that he would insist upon a reduction of at least $200,000 a year in the city's contract. Arrangements have been made for the advertisement of the street lighting contract for 1915. Should the Philadelphia Electric ignore the department's demands for a reduction in rates comparable to those which other cities pay, it is probable that an application will be made to the public utilities commission for permission to build a municipal plant. That would raise the question of the necessity of such a plant and give the city an opportunity to present the facts. "Practically all electric street lights in Philadelphia are arcs," said Director Cooke. "There are no public tungsten lamps. There are in Pennsylvania 147 towns in which the arc lights burn the 4,000-hour or so-called "all-night" schedule used in this city. Philadelphia stands almost at the head of this list as to high prices. In fact, there are only ten out of these 147 cities and towns which pay over $80 per year. Philadelphia pays an average of $84.50 for approximately 14,000. The others are divided as to the price paid per year as follows:

38 pay between $70-$79.
68 pay between $60-$69.
23 pay between $50-$59.
5 pay less than $50.

"Among all the cities in the United States of 100,000 population or over, only ten, including Philadelphia pay $81 and over. The others are divided as follows as to price per lamp per year:

15 pay between $70-$80.
18 pay between $60-$79.
7 pay between $50-$59.
5 pay less than $50.

"The five large cities obtaining modern arc lamps at a total cost of less than $50 per year are:

Detroit, municipal plant	$46.81
Cleveland, municipal plant and corporation	49.80
Spokane, corporation	48.00
Toledo, corporation	45.00
St. Louis, corporation	49.65

Municipal Light Plant Opened.

Whitesboro, Texas.—This city has put its municipal light plant into service on April 4. This plant has been in process of construction for the past eight months. It is complete and modern in every detail and has a capacity to supply a city of 5,000 people. Whitesboro also owns her own waterworks plant, which is supplying service at a small profit to the city.

FIRE AND POLICE

Favor Incorporating Aqueduct Police.

New York, N. Y.—Douglas I. McKay, who retired as Police Commissioner, appeared at the hearing before the Mayor to favor a bill allowing 275 members of the Board of Water Supply Police to be transferred to the city Police Department without taking a physical or a civil service examination. Mr. McKay was formerly Deputy Commissioner of Aqueduct police, and said that the force was a fine body of men and could come to the city with four or five years' experience of police work. Borough Presidents Pounds of Brooklyn and McCormack of Richmond, both said it would be a good thing for the Police Department if the men could be transferred. The Mayor did not indicate what he intended to do with the bill, but it was understood that he would approve it, providing it could be shown that the men were thoroughly capable of police duty.

Millions Spent in Fire Protection.

Washington, D. C.—According to the census, 195 cities with a population exceeding 300,000 have spent $47,385,546 on their fire departments during the year 1912. These cities spent $59,776,622 for police protection during the same period, which is 25 per cent. more than for fire protection. Cities having a population greater than 600,000, spent more for police than for fire protection and where the population ranges from 30,000 to 300,000 the opposite was true. Three cities spent more than $3 per capita on their fire departments; Omaha spent $3.65; San Francisco, $3.60, and Atlantic City, $3.56.

MOTOR APPARATUS

Engine and Hose Wagon Arrive at Exposition.

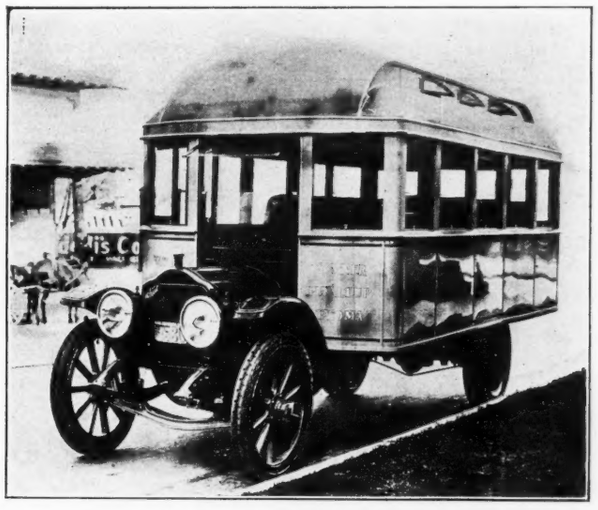
San Francisco, Cal.—The first two pieces of motor fire apparatus to be used on the Panama-Pacific International Exposition grounds have arrived and have been installed in the fire headquarters, near the Service building, as Company 1. There will be ten pieces of equipment in all, representing an outlay of approximately $100,000. A combination pumping engine and hose wagon and a high-pressure hose wagon were the machines that came. The hose wagon contains a turret pipe. Both machines are equipped with powerful six-cylinder motors. Within the near future the exposition's motor fire apparatus will comprise three hose wagons, three combination engine and hose wagons, two ladder trucks, one chemical engine and one squad wagon. The equipment is all the make of the American La France Company.

Test Boyd Pumping Engine.

Newark, N. J.—Seven hundred and eighty-six gallons per minute was the record of the new Boyd six-cylinder pumping engine recently delivered to the City of Newark, N. J. The acceptance test was run before Chief Paul Mooro and the Board of Fire Commissioners. The pump is rated at seven hundred gallons per minute, but delivered seven hundred and eighty-six at 125 pounds pressure, underwriters' conditions from suction. Chief Mooro and the commissioners expressed themselves as highly pleased with the result and commented favorably on the heavy construction and smooth running of the machine. This is the second piece of apparatus James Boyd & Brother, Inc., Philadelphia, have delivered to Newark recently. The first was an 85-foot aerial truck which is giving good service and has responded to many alarms promptly.

Motor Busses to Operate Between Three Cities.

Tacoma, Wash.—In the April 9th issue of Municipal Journal, the opening of a bus line in Tacoma was announced. It was stated that four White cars, each of one and a half tons capacity, would be used. The accompanying illustration shows one of the busses, purchased by the Tacoma Transit Company, which will operate between Sumner, Payallup and Tacoma.



WHITE MOTOR BUS IN TACOMA.

Test La France Engine.

Walden, N. Y.—F. G. Oakley, representing the American-La France Fire Engine Company of Elmira, has, despite the pouring rain, conducted a demonstration of a 45-gallon chemical fire engine manufactured by the Elmira concern. This engine was ordered on approval by the board of trustees in compliance with the recommendation of the Board of Underwriters.

Test Pumping Engine.

Schenectady, N. Y.—Before a crowd of citizens, city officials, officers of the fire department and several fire chiefs from nearby cities the new Knox triple combination apparatus for Fire Station No. 7 has been given its official test. The pumping test held at Fuller's Pond, lasted for an hour.

GOVERNMENT AND FINANCE

Plan to Train City Managers.

Topeka, Kan.—Kansas having proved the success of the commission form of government for cities is seriously considering a commission government of the state. The next move in the direction of better government which Kansas proposes to undertake is the training of city managers, professional men skilled in handling everything in city affairs, except politics. The state board of administration in charge of all the state schools may offer in the next school year a course of study for city managers and the legislature will be asked to pass an enabling act so that the cities of the state may generally adopt the new plan of city government. Prof. F. W. Blackmar, head of the department of sociology of the University of Kansas, has been directed by the board to prepare an outline of the proposed professional course of study for city managers.

City Manager Plan Successful in Clarinda, Ia.

Clarinda, Ia.—After a year's operation under the business manager plan, Clarinda, the only Iowa town having adopted this system, declares it to be a success. Of 101 cities in the state required to file annual reports with the state municipal accounting department, Clarinda is the first to produce its statement. In April, 1913, Clarinda selected T. A. Wilson as its city manager and turned the affairs of the city over to him. The financial statement shows he finished the year with a cash balance of $17,265.74 compared with a balance of $12,933.82 at the close of the year previous. The total expenditures for the year were $27,755.01, as against $30,318,24 for the year before. The city debt was reduced $4,000. The municipal water plant sold water at 20 cents a thousand gallons and paid the city a good profit.

Senate Favors Home Rule for N. J. Municipalities.

Trenton, N. J.—Without a dissenting vote, Senate concurrent resolution No. 7, providing for an amendment to the Constitution permitting "home rule" on all questions not prohibited by statute, introduced by Senator Hutchinson, has been passed by the Senate. No senator spoke against the measure, and when put to a vote 14 voted in the affirmative. This proposed amendment has yet to pass the Assembly. Under it municipalities could legislate for themselves on all subjects of local character excepting, of course, the excise question and like matters of State policy.

Committee to Study Taxation.

New York, N. Y.—Mayor Mitchel has appointed a committee of twenty-five citizens, to be known as the Mayor's Taxation Committee, to study methods of taxation in use here and in other cities in this country and abroad. The committee, which is to act as a voluntary one, is made up as follows: A. E. Marling, R. S. Binkerd, G. Cromwell, F. H. Field, J. N. Francolini, F. C. Howe, H. Holt, Jeremiah W. Jenks, W. Lindner, F. C. Leubuscher, C. C. Miller, L. H. Pink; D. Rumsey, O. R. Seitz, R. E. Simon, E. R. A. Seligman, F. S. Tomlin, D. F. Wilcox, L. Purdy, C. T. White, J. J. Halleran, C. Woodward, A. L. Kline, F. B. Shipley and G. V. Mullan.

Will Vote on Commission Government.

Collingswood, N. J.—Petitions calling for a special election on commission government for Collingswood have been filed with Borough Clerk William J. Hambrecht, Jr., and the election day has been set for Tuesday, April 21.

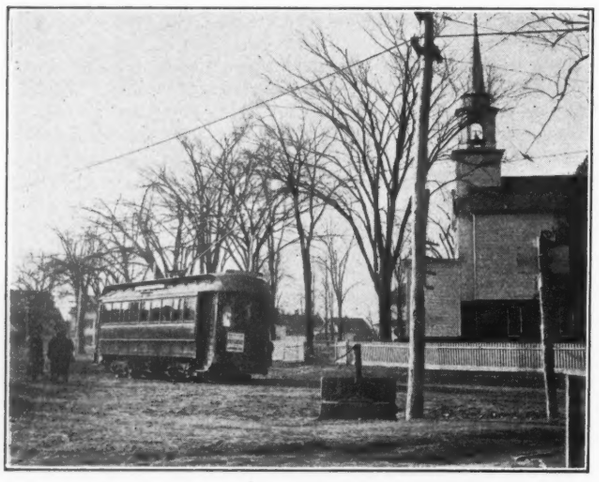
Commission Government Elected.

Irvington, N. J.—Complete returns show that commission form of government has been selected by the town of Irvington. The vote was 787 for to 702 against. The election for commissioners will be held May 12.

RAPID TRANSIT

Extend Trolley System.

Providence, R. I.—The automobile stage, which used to run between the village of Greenville and this city, was recently supplanted by electric cars which will run hourly.



Courtesy The Providence Journal.

FIRST ELECTRIC CAR IN GREENVILLE.

The trip can now be made within the space of 40 minutes. The fare charged is fifteen cents. It is now possible for the villagers to go shopping and attend functions in Providence more easily than heretofore.

San Francisco Extends Municipal Railway.

San Francisco, Cal.—The contract for constructing the Municipal Railway on Van Ness avenue and Chestnut street, which was awarded recently to Mahoney Brothers by the Board of Public Works, has been signed and work commenced. The contractors are allowed 150 days from the signing of the contract for the completion of the construction, and for finishing it ahead of time they will be given a bonus of $500 a day, the bonus period to be not more than thirty days. It is expected that the railway line will be built early in August and be in operation by September. The contract price, aside from the bonus, is $219,747.50.

Wheel-Guards Save Eleven Lives.

New York, N. Y.—Reports to the Public Service Commission for the First District show that in three days eleven persons were run down by street cars, and ten of them were saved by the operation of the wheel-guards. These wheel-guards were installed upon all surface cars in the City by order of the Commission, and their efficacy in saving human life has been proved time and again. It is not often, however, that so many accidents occur within such a short space of time, and to make the incident further remarkable one of the accidents involved two boys who were picked up together, and another, a man 45 years old, who escaped with nothing worse than bruises. The accidents occurred in various parts of the City on April 4th, April 6th and April 7th.

MISCELLANEOUS

Voting Machines Save $888 in One Election.

Flint, Mich.—Figures compiled in the office of City Clerk Newcombe show that there was $888.06 saved in the spring election this year through the use of voting machines, over the amount paid for the spring election of 1913. The comparative figures showing the cost of the ballots and the wages of clerks and inspectors in the elections of last year and this year indicated that last year $1,291 were spent for payroll and $87.06 for ballots and this year $422 for payroll and $68 for ballots. This decrease in the cost of the election this year with the machines comes despite the fact there were charter and bonding propositions ballots to be printed this year. These and the official emergency ballots printed in case the machines did not work, together with the instruction ballots and the slips used in the various machines cost less than the official ballots and the instruction ballots alone did last year.

Urge Art Commission.

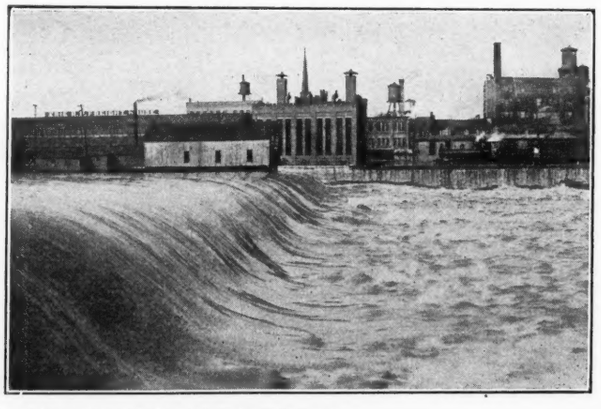
Berkeley, Cal.—A civic art commission, to which all matters of city planning will be referred, has been urged in connection with several charter changes. The Board of Freeholders has been drawing up a number of charter provisions that would include the city manager form of government. An election to pass upon these changes will be held soon.

Public Market Revenues Only for Market Upkeep.

Pittsburgh, Pa.—Judge James R. Macfarlane in Common Pleas Court has returned a decision granting an injunction restraining the city of Pittsburgh from using the money derived from rents in the North Side market house for any other purpose than the upkeep and maintenance of the building. The decision will force the city to keep a separate fund or account for the market house revenues and account for the expenditure of these funds. In the July term of court 1913, certain stall renters in the market began action to compel the city to devote the rent money to maintenance of the market building instead of putting the money into the general funds of the city. As the ground was given to the City of Allegheny solely for market purposes and as one of the stipulations of the property transfer was that all revenues be used for market purposes, the court held the city had no authority to divert the rental funds into other channels. The rents amount to $37,000 a year.

No Danger of Flood in Rochester.

Rochester, N. Y.—City officials who have closely observed the Genesee River stated that all danger of flood in Rochester this spring is practically over. It is believed that the river has attained its height and has been able



Courtesy Rochester Evening Times.

GENESEE RIVER AT ITS HIGHEST THIS SPRING.

to carry off safely all the water from the spring thaws and rains.

Pass Street Sign Board Regulation.

Providence, R. I.—Stringent regulation of sign boards suspended from buildings over the sidewalks of public highways is provided in a resolution adopted recently by unanimous action of the Common Council. The measure will go to the Board of Aldermen April 16 for action in concurrence. It provides that no sign extending more than 12 inches over the sidewalk shall be erected without the permission of the inspector of buildings. No sign shall be erected which does not relate directly to the business

conducted within the building to which it is attached. This clause is to prevent the use of such signs as billboards for miscellaneous advertising. The ordinance further provides that all signs shall be constructed in a manner satisfactory to the Inspector of Buildings. The signs shall be placed upon the buildings in such a way as not to interfere with any street lights, and if any signs do interfere with the street lighting they must be removed at the order of the public service engineer.

City Engineer Will Also Be Street Commissioner.

Bangor, Me.—The office of street commissioner has been combined with that of city engineer at a salary of $2,150 a year. This action was taken in response to the petition asking that a technical man be placed in charge of the city's streets. An attempt was made to include the superintendent of sewers in the combination of offices, but owing to the excellent showing made in that department by the present head and the fact that a majority of the board of aldermen was opposed to the change, it was unsuccessful .

Would Close River Front Baths.

New York, N. Y.—Mayor Mitchel said recently that he believed with Health Commissioner Goldwater that the public and private baths along the river fronts should be closed this summer to avoid contagion due to the water being polluted with sewage. "In my opinion," said the Mayor, "bathing in our rivers is more likely to breed disease than to prevent it during the hot weather. I think that the solution of the bathing problem will be in the increase in the number of inland bathhouses. The proposition is entirely up to Commissioner Goldwater. I am glad he has decided to handle the matter as his scientific judgment dictates."

Maine Cities May Have Municipal Coal Yards.

Bangor, Me.—The constitutionality of the statute empowering any city or town to maintain permanently a yard for the purpose of selling at cost to its inhabitants coal, wood and other fuel has been upheld in a rescript handed down from the Supreme Court of Maine. The rescript, drawn by Associate Justice Leslie C. Cornish in part states: "We do not regard it (the act) as a departure from previous legislation, but in line with it, although perhaps one step further. The direction, however, is the same, and the advance is caused by the development of a new want which has called for a new exercise of legislative power, not an exercise of new legislative power, and such an advance is both legitimate and commendable.

Need $100,000 More to Complete Elaborate Almshouse.

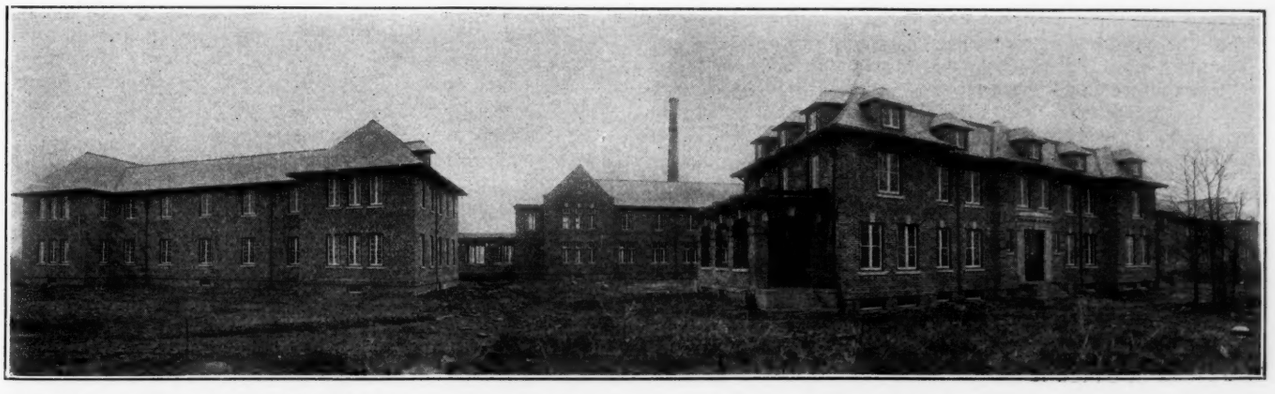
Newark, N. J.—Modeled after the home for aged in Washington, Newark's new almshouse, with its seven commodious buildings commanding a prominent view from the crest of Ivy Hill, is rapidly nearing completion. These buildings were constructed at a cost of $300,000, and the finishing of the interior work contingent upon a bond issue of $100,000, will make them ready for occupancy within a few weeks. The structures are grouped about a central administration building and are made of red brick with limestone trimmings. To the rear there is located a boiler house topped with a 200-foot brick chimney. White walls and dark chestnut trim are used in all the interior finish except in the case of the administration building, where the walls will be tinted and the trim of quartered oak.

Oakland's Municipal Building Formally Opened.

Oakland, Cal.—Oakland's new city hall, which was built at a cost of $2,000,000, exclusive of ground, was recently opened to the public. The building is constructed of granite. The entrances are of beautifully ornamental bronze and lead to a large rotunda, the rounded dome of which is 86 feet above the floor. The council chamber is artistically designed with Egyptian pillars, ornamental ceiling and classic galleries.

Courtesy Oakland Enquirer.

OAKLAND'S NEW CITY HALL.



Courtesy The Newark Evening News.

SOME OF THE BUILDINGS OF NEWARK'S NEW ALMSHOUSE.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Personal Injuries—Condition of Street.

Faber v. City of New York.—Municipalities are not liable as for negligence by reason of slight depressions or differences of grade in the street.—New York Supreme Court, 146 N. Y. S., 295.

Fires—Destruction of Property—Common Law Liability.

Page v. Town of Warrenton.—A municipal corporation is under no common-law liability to a citizen for damages for property destroyed to prevent the spread of fire.—United States Circuit Court of Appeals, 210 F. R., 431.

Assessment in Street Opening—Enhancement of Value.

In re Newkirk Ave. in City of New York.—The commissioner of assessment in street opening proceedings should take into account the enhancement of value resulting from the improvement in assessing benefits.—New York Supreme Court, 146 N. Y. S., 216.

Personal Injuries—Construction on Highway.

Maloney v. Bradley Contracting Co.—Where unusual or dangerous conditions prevail in a highway where repair work is going on, a pedestrian must exercise such unusual care as the unusual conditions call for.—New York Supreme Court, 146 N. Y. S., 242.

Appropriation of Water of Stream—Previous Use.

Cuyahoga River Power Co. v. City of Akron et al.—A municipality has a paramount right to appropriate property needed for city water supply, though it had been previously appropriated by a quasi public corporation for the development of hydroelectric power.—United States District Court, 210 F. R., 524.

Incorporation—Notice.

Hoffecker v. Board of Supervisors of Los Angeles County et al.—Where the notice of presentation of a petition for the incorporation of a sixth class city was published on September 13 and September 20 in a weekly newspaper published in the county, there was a sufficient publication for two weeks as required by statute.—District Court of Appeals, California, 138 P. R., 371.

Defects in Street—Liability.

Engel v. City of New York.—A city was not liable for injuries sustained from a fall caused by plaintiff's stubbing her toe at a place where there was a drop in the sidewalk, which plaintiff's witnesses estimated at 3 to 4 inches, but which other witnesses, who made actual measurements, testified was only 1½ inches, especially where it was not shown that the city had notice.—New York Supreme Court, 146 N. Y. S., 307.

Contracts—Completion of Work by City.

E. F. Keating Co. v. City of New York et al.—Where a city, in accordance with the contract, notified the contractor to discontinue work because of delay, and that the work would be completed at its expense, such notice operated as a termination of the employment, rather than a cancellation of the contract, and the contractor was entitled to the balance of the contract price after deducting the cost of finishing the work.—New York Snpreme Court, 146 N. Y., 222.

Discharge of Employees—Notice and Hearing.

Colgarry et al. v. Board of Street & Water Com'rs of City of Newark.—When a municipal corporation bona fide, and in the interest of efficient and economical administration, determines to reduce the number of its employes by abolishing certain positions in its service, the employes thus removed from their positions are not entitled to notice and an opportunity to be heard in relation to such a proceeding, for neither the civil service act nor the veteran act nor the board of works tenure of office act protects them from such removal or discharge.—Court of Errors and Appeals of New Jersey, 89 A. R., 789.

Assessment—Front Foot Basis—Guesswork.

Franklin Society for Home Building v. Borough of Haworth.—Where an assessment for street improvements was made in part upon a front foot basis and in part by guesswork, with the result of distributing a known amount of costs upon some properties to the practical exclusion of others, contrary to the statute requiring a just and equitable assessment of the damages and benefits, the assessment will be vacated and a new assessment ordered.—Supreme Court of New Jersey, 89 A. R., 772.

Sewers—Liability for Defects.

Sanborn et al. v. Village of Engsburg Falls.—An eight-inch tile and sluice crossing a village street, as well as a barrel catch-basin into which a tile runs under the sidewalk, and from which a tile runs underground, connecting with the sewer, which tile was installed to protect the sidewalk and carry the surface water into the sewer, were not any part of the sewer system but were maintained by the village in its governmental capacity to protect the highway, so that it was not liable for injury to adjacent property by negligence of the village officers in maintaining the sluice and tile.—Supreme Court of Vermont, 89 A. R., 746.

Dedication of Street—Filing of Plat.

Board of Trustees of Village of Ridgefield Park v. New York, S. & W. R. Co.—The filing in a public record office by a landowner of a sales map or plat showing the land divided into blocks and lots with intersecting streets, and the sale and conveyance by such owner of lots by reference to said map, constitute a dedication to public use of the streets so delineated so far as the title of such owner to the lands plotted thereon extends.—Court of Errors and Appeals of New Jersey, 89 A. R., 773.

Death of Prisoner—Liability of Town.

Nichols v. Town of Fountain.—A rural town of 150 inhabitants employing but one policeman was not liable for the death of an intoxicated person while in the lockup in the municipal building, caused by the destruction of such building by fire, though it employed no guard or watchman, since, if a municipality properly constructs and furnishes the prison and exercises ordinary care in providing the usual necessaries for the prisoner, it is not liable for the negligence of its officers to properly care for and administer to the wants of the prisoners.—Supreme Court of North Carolina, 80 S. E. R., 1059.

Elevated Railroads—Regulation.

Metropolitan West Side Electric Ry. v. City of Chicago.—Corporations organized under the Railroad Law to operate elevated railroads for the carriage of passengers only are not street railroads, within the purview of Cities and Villages Act, authorizing municipalities to regulate hackmen and other carriers using the street, and to fix their compensation even though part of their right of way is through the city streets; it appearing that the elevated railroads maintained regular stations for the reception and discharge of passengers, and did not stop at any point, as is the custom with street railways and hackmen, and hence the municipality cannot, on the theory that the elevated railroads are street railroads, regulate their charges.—Supreme Court of Illinois, 104 N. E. R., 165.

Special Assessments—Mutual Rights.

Granite State Land Co., vs. Town of Hampton et al. Town of Hampton vs. Dow. Dow vs. Town of Hampton et al.—Where a town leases its land for an annual rent for a long term of years, and the lessee sublet to others, and the town constructed sewers benefiting the land, the lessees could not recover back such assessments either under a provision of the lease with the town that the land should not be taxed, or under the common law; such assessment being a tax on the interests of the lessees, and not on the lessor's interest in the property. Supreme Court of New Hampshire, 89 A. R. 842

NEWS OF THE SOCIETIES

Calendar of Meetings.

April 23-24.
VIRGINIA PUBLIC HEALTH ASSOCIATION.—Annual meeting, University of Virginia, Charlottesville. Dr. M. G. Perrow, Lynchburg, Va., president.

MAY 5-7.
NATIONAL FIRE PROTECTION ASSOCIATION.—Annual Meeting, Chicago, Ill. F. H. Wentworth, Secretary, 87 Milk street, Boston, Mass.

April 9-10.
FLORIDA STATE GOOD ROADS ASSOCIATION.—Annual meeting, Gainesville. A. B. Dunning, Secretary, Jacksonville.

April 16-17.
SNOW REMOVAL CONFERENCE.—City Hall, Philadelphia, Pa. M. L. Cooke, Director of Public Works.

May 11-15.
AMERICAN WATER WORKS ASSOCIATION.—Thirty-fourth Annual Meeting, Philadelphia, Pa. J. M. Diven, secretary, 47 State street, Troy, N. Y.

May 12-14.
AMERICAN ASSOCIATION FOR THE PROMOTION OF HYGIENE AND PUBLIC BATHS.—Annual Convention, Newark, N. J.

May 14-15.
NORTH CAROLINA ASSOCIATION OF MAYORS.—Annual convention, Charlotte.

May 18-23.
FIRST CANADIAN AND INTERNATIONAL GOOD ROADS CONGRESS.—The Arena, Montreal, P. Q. G. A. McNamee, General Secretary, New Beiks Buildings, Montreal.

May 20-30.
ELECTRICAL LEAGUE OF CLEVELAND, O.—Exposition, Coliseum, Cleveland, O. W. G. Rose, Manager, Illuminating Building, Cleveland.

May 26-28.
CITY MARSHALS AND CHIEFS OF POLICE ASSOCIATION OF TEXAS.—Twentieth Annual Convention, San Antonio. C. W. Newby, Secretary, Fort Worth.

June 1-3.
NATIONAL CONFERENCE ON CITY PLANNING.—Annual Meeting, Toronto, Canada. Flavel Shurtleff, Secretary, 19 Congress street, Boston, Mass.

June 1-5.
NATIONAL ELECTRIC LIGHT ASSOCIATION.—Thirty-seventh Convention, Bellevue-Stratford Hotel, Philadelphia, Pa. T. C. Martin, Secretary, 29 West 39th street, New York City.

June 3-5.
CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS OF THE STATE OF NEW YORK.—Fifth Annual Conference Auburn, N. Y W. P. Capes, Secretary, 105 East 22d street, New York City.

June 23-25.
SOUTH CAROLINA STATE FIREMEN'S ASSOCIATION.—Tenth Annual Meeting and Tournament, Florence, Ala. R. S. Hovel, Secretary, Sumpter, S. C.

June 30-July 4.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Seventeenth Annual Meeting, Hotel Traymore, Atlantic City, N. J. Edgar Marburg, Secretary, University of Pennsylvania, Philadelphia, Pa.

October 20-23.
INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS.—Annual Convention, New Orleans, La. James J. McFalls, Secretary, Roanoke, Va.

First Maine Roads Conference.

The meeting opened in the Auditorium, Bangor, April 7, under the auspices of the Maine State Highway Commission. The conference was intended as a school of instruction for road commissioners and road engineers, as well as citizens generally who are interested in highway improvement. C. F. Bragg, president of the Chamber of Commerce, made the address of welcome. He spoke of the new highway law in its financial bearings, saying that it was estimated that automobile taxes would pay the cost of the trunk line roads. Governor W. T. Haines made a brief address. Lyman H. Nelson, Chairman State Highway Commission, responded to the address of welcome. He explained the highway law, which created the commission which assumed office last July. He said that the funds available amounted to about one and a quarter million dollars annually. The 1914 program contemplated the production of a large mileage of new state roads, state aid roads and the maintenance of highways built during the last five or six years by the use of state funds. He asked for the cooperation of the towns in the road improvement movements and expressed the hope that all political considerations be ignored. Prof. George T. Files, Bowdoin College, spoke on improved highways, illustrating his address with stereopticon pictures. In the evening the exhibition hall was open. Moving picture exhibitions and addresses were made by representatives of the Barber Asphalt Paving Co., the Lehigh Portland Cement Co., and the Warren Bros. Co.

The first speaker at the second day's session was S. Percy Hooker, state superintendent of highways of New Hampshire, who described the construction and maintenance work in his state. State aid work began in 1905 and a trunk line system in 1908. The latter have been paved with various kinds of bituminous macadam at a cost of $7,000 to $11,000 per mile. On local roads, much gravel has been used. As much care is given to the fundamentals of alignment, drainage and grade in the case of gravel roads as for the more expensive ones. Seventy-one per cent. of state aid roads are gravel. The cost is about $4,000 per mile. Repairs by individual patrolmen are satisfactory for the gravel roads.

Walter M. Denman, consulting engineer, Springfield, Mass., spoke of American and European highway bridges. Practically all European bridges are of masonry; very substantial, and many of them very old. In this country, the attempt has been made to bridge as many streams in 200 years as have been built in Europe in 2,000 years. Many wood and later steel bridges have been built, now, however, concrete is the principal material used. Seventy per cent. of bridges built in Maine in the last few years have been concrete.

Col. Sohier, chairman, Massachusetts Highway Commission, described the roads of the Bay State. After reviewing questions of finance, costs and methods the speaker spoke of roads as an asset. He quoted town officials who had assured him that the valuation of lands on state highways had doubled. He predicted that similar results would follow the construction of improved roads in Maine.

Prof. Geo. T. Files, Bowdoin College, spoke on Improved Highways, describing the highways of Europe and the benefits derived from them.

C. S. Stetson, master of the State Grange, outlined the position of the farmers regarding roads. They ask that the roads be built for the purpose of transporting the commerce of the consumer by the most direct route and at the least possible cost; the building of expensive boulevards for the accommodation of traffic of doubtful value, which lasts but a small portion of the year. He said there was a possibility of saving $2,500,00 in cost of transportation of farm products.

John C. Scates, West Brook, secretary of the Maine Automobile Association, spoke of the use of prisoners on the roads and advocated a system patterned after that of Colorado, Florida, and some other states.

M. O. Eldridge, Office of Public Roads, Washington, spoke on Road Maintenance. The terms "maintenance" and "repair" are frequently confused, he said. The former means to keep a road constantly in good condition, the latter to restore the surface after it has been partially destroyed. The subject of maintenance divides into two heads, systems, involving administration and methods, treating of technical details of the work. The patrol system he defined as that which provides for the permanent employment of skilled laborers or care-takers, each one having care of a particular section. The gang system provides for the employment of a corps of skilled laborers and is particularly effective for bituminous macadam repairs. The ideal system he thought would be a combination of the two.

Paul D. Sargent, State Highway Commissioner, was the last speaker. Briefly he sketched the progress of road work in the state of Maine, stating that after talking about such for a good many years, some attempt at building improved roads had been made in the past dozen years and that for six years the efforts have been more or less concentrated through the work of the State Highways Department.

Upwards of 1,000 miles of road have received improvement by state aid and since 1908 the department can show the records of 720 miles that have been improved. Critics assert that not much of anything has been accomplished, but such criticism, the speaker remarked, proceeds from lack of information and from false premises.

The following firms had exhibits of machinery or materials:

United Construction Co. (road machinery and bridges), Albany, N. Y.

Penn Metal Co., Boston, Mass.

Northeast Culvert Co., Nashua, N. H.

Berger Steel Co., Boston, Mass.

Wheeling Culvert Co., New York.

Merrimac Foundry and Machine Co., Lawrence, Mass.

International Harvester Co., Chicago, Ill.

Harold L. Bond Co., Boston, general contractors' supplies.

Pereley Dyer Supply Co., Boston, Mass. (Road machinery.)

C. M. Conant, Bangor. (Road machinery.)

Universal Machinery Co. (Stone crushing plants), Kingston, N. Y.

Buffalo-Pitts Co., Buffalo, N. Y. (Tractors and wagons.)

Good Roads Machinery Co. (Road machinery), Boston, Mass.

Eastern Cement Co., Bangor.

Robeson Process Co. (Glutrin), New York City.

U. S. Asphalt Refining Co. (oils), New York City.

Warner-Quinlan Refining Co. (oils), New York City.

Warren Bros. Co., Warrenite, etc., Boston, Mass.

Independent Coal Tar Co., Boston, Mass.

American Tar Co., Boston, Mass.

Barrett Co., Boston, Mass. (Tarvia.)

Standard Oil Co.

Barber Asphalt Paving Co., Philadelphia, Pa.

Hedley Good Roads Co., of Philadelphia. Road builders and dust preventatives.

Atlas Portland Cement Co.

Buff & Buff, Jamaica Plain, Mass. (Engineering instruments.)

Acme Road Machinery Co., Frankfor, N. Y.

Good Roads Magazine.

Philadelphia Snow Removal Conference.

The meeting will be held in the Mayor's reception room, City Hall, April 16. The following program has been announced by M. L. Cooke, director Department of Public Works:

THURSDAY, APRIL 16.

7.30 P. M.—Dinner at Union League to visiting delegates tendered by Mayor Blankenburg.

FRIDAY, APRIL 17.

9.30 A. M., First Session: 1. Address of welcome. 2. Organization 3. Four 15-minute papers on present practice; "How New York Spent $2,500,000 in Snow Removal," by J. T. Fetherston, Street Cleaning Commissioner, New York; "Snow Removal in an Inland City," by J. G. Hayes, Director of Public Works, Scranton, Pa.; "Handling Snow in Boston With a Municipal Force," by Louis K. Rourke, Commissioner of Public Works, Boston; "Philadelphia's Experience in Handling Snow Under the Contract System," by William H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia. 12.30 Noon—Round table luncheon at the City Club, in charge of E. D. Very, Consulting Engineer of New York, formerly Sanitary Engineer New York Department Street Cleaning. 2 P. M. Second Session—1. Five 15-minute papers: "The Citizen's Part in Snow Removal," Dr. Marie D. Equi, Member of Civic League, Portland, Ore.; "Snow Removal from a Contractor's Standpoint," by John W. Doherty, Belmont Construction Co., Philadelphia; "The Police and Snow Removal," by James Robinson, Supt. of Police, Dept. of Public Safety, Philadelphia; "Snow Removal by the Street Car Company," by Martin Schreiber, Engineer Maintenance of Ways, Public Service Railway Co., of New Jersey; "Snow Removal as a Field for Engineering Study," by Morris R. Sherrerd, Chief Engineer, Board of Street and Water Commissioners, Newark, N. J.; 2. Report of the committee on resolutions, Captain Mark Brooke, Corps of Engineers, U. S. A., Assistant to Engineer Commissioner, Washington, D. C.

Society of Engineers of Eastern New York.

The annual meeting was held in Schenectady April 8. In the afternoon a visit was made to the works of the General Electric Company and inspection of the various deparments made, where there are enough members employed to act as guides and explain the different processes of the construction of the electrical apparatus. After the inspection luncheon was served at the General Electric restaurant.

At 8:15 o'clock at night the business meeting was held in the new gymnasium at Union College. At this meeting Henry W. Hodye of New York made an address on "Modern Bridge Engineering," which was illustrated by lantern slides.

The following officers were elected: President, Francis E. Crane, Amsterdam; vice-president, Eugene Touceda, Albany; treasurer, Robert Reid, Schenectady; member of executive committee, M. G. Barnes, Albany; member of finance committee, C. G. Hulth, Schenectady.

New England Water Works Association.

At a special meeting of the Association to be held at Hotel Brunswick, Copley Square, Boston, Wednesday, April 15, 1914, the following program will be carried out:

11 A. M.—Meeting of the Executive Committee at the headquarters, Tremont Temple; 11:30 to 12:30 A. M., exhibition of gate operation by means of attachment to automobile, designed by George H. Finneran, Water Service Department of Public Works, Boston, Mass., at corner of Boylston and Arlington streets; 1 P. M. lunch will be served at Hotel Brunswick, Copley Square.

2 P. M.—Paper, "A Study of Cast Iron Bell and Spigot Water Pipe Joints by the Public Works Department, City of Boston," by Clarence Goldsmith, Assistant Engineer. Report of Committee "To Prepare a Standard Specification for Fire Hydrants. H. O. Lacount, George A. Stacy, F. A. McInnes, Frederick W. Gow, William F. Sullivan.

Frank A. McInnes, Boston, Mass., is president, and Willard Kent, Narragansett Pier, R. I., secretary.

International Association of Chiefs of Police.

Although the matter has not been definitely decided, it is thought that the annual convention of the fire and police chiefs of America, which is to be held in Grand Rapids in June, will take place from June 9 to June 16, inclusive.

PERSONALS

Irwin, Thomas E., formerly superintendent of the water works at Huntington, L. I., is now eastern representative for H. W. Clark Co., Mattoon, Ill., manufacturers of meter boxes and housings.

Eaton, Robert L., Elizabeth, N. J., has been appointed a member of the Joint Sewer Commission to succeed Walter C. Bauer.

Griffiths, Austin E., Seattle, Wash., who was recently defeated for mayor, has been appointed chief of police by his successful opponent, Mayor Gill.

McGovern, James, Pittsfield, Mass., has been appointed superintendent of parks.

The following candidates, interested in municipal work, were elected to membership in the American Society of Civil Engineers: Martin Joachimson, assistant engineer, Department of Bridges, New York City; R. E. Milligan, general manager, New York Continental Jewell Filtration Co., New York City; C. M. Talbert, street commissioner, St. Louis, Mo.

The following were elected associate members: F. W. Albert, assistant engineer, Water Department, Washington, D. C.; J. J. Baker, resident engineer, Johnstown Water Co., Mineral Point, Pa.; John Laylin, city engineer, Norwalk, O.; G. J. Requarat, assistant division engineer, Disposal Division Sewerage Commission, Baltimore, Md; S. E. Shoup, assistant engineer, Department of Sewers, Cincinnati, O.

The following mayors have recently been elected in Iowa:

Adair—F. E. Gates.
Ackley—S. J. Lieuwen.
Ames—Parley Sheldon.
Burlington—N. G. Gross.
Council Bluffs—Dr. B. M. Synder (Rep.).
Cedar Rapids—Louis E. Roth (re-elected).
Clinton—W. B. Farver (Dem.).
Carroll—Dr. A. Kessler.
Des Moines—James R. Hanna (third term).
Dexter—B. C. Hemphill.
Denison—W. H. Laub.
Eldora—C. F. Newcomer.
Eddyville—J. A. Lafer[illegible].
Forest City—R. R. Jacobs.
Greenfield—C. H. Williamson.
Grundy Center—C. E. Butler.
Hawarden—C. W. Keniston.
Iowa Falls—C. C. Buck.
Keokuk—S. W. Moorhead.
Keosuagua—C. K. Manning.
Lamoni—C. W. Blair.
Leon—George H. Farquhar.
Logan—J. C. Milliman.
Malvern—George Smith.
Mount Vernon—T. K. Mitchell.
Mount Ayr—H. M. Miller.
Panora—E. E. Kellogg.
Sioux City—A. A. Smith (third term).
Sigourney—J. H. Wylie.
Spencer—Eugene Bender.
Waterloo—R. C. Thompson (re-elected).
West Liberty—Charles Mackay.

NEW APPLIANCES

HUMPHREY GAS PUMP.

Operates on Consumption of 1.1 Pounds of Coal Per Horse Power Hour.

Humphrey Gas Pumps were first built and installed for the London Metropolitan Water Board and comprised five units. One was designed for a capacity of 14,000 imperial gallons per minute with a diameter of play pipe of 4 feet 3 inches. The four large pumps were for a capacity of 28,000 Imperial gallons per minute each with a diameter of 6 feet. The five pumps were arranged side by side to take water from the river Lea and discharge it at a head of between 25 and 30 feet above the river level into the new Chingford reservoir, which has a capacity of 3,000,000,000 gallons. So rapidly do the floods come down that a pumping station of large capacity is needed.

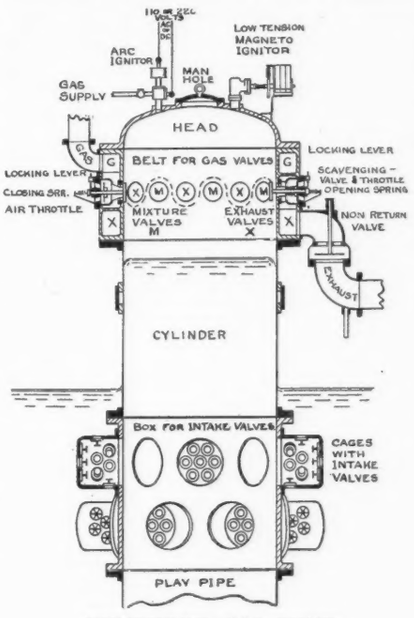
The Humphrey Gas Pump Co., Syracuse, N. Y., has been organized to make these pumps for the American market. The patents owned by the company also include those granted to William H. Smith, who carried on experiments along parallel lines in California at about the same time.

The parts comprising Mr. Humphrey's invention are few. A cylinder in which combustion of mixtures of air and gas takes place, fitted with valves for inlet of mixture, and exhaust of burned products of combustion, with non-return valves, is mounted directly above intake valves for water. The play pipe, in which a long column of water surges or swings back and forth, extends outward and upward from the intake valves into a conical tower or other form of compensating accumulator. A pipe for continuous discharge leads off from this tower. An electrical igniter and a simple mechanism for interlocking alternately the valves for mixture and those for exhaust completes the necessary apparatus.

The cycle of operation is nearly an ideal one. To start with, a proper mixture of air and gas are forced into the cylinder by a small compressor, until the level of the water in the cylinder is depressed against the head at which it is to be discharged, and until a charge volume is filled with mixture partially compressed. This charge is fired by an electric spark.

First Stroke—Expansion and Intake of Water: The column of water in play pipe and tower, driven outward by the force of the explosion, gains momentum and continues in motion after the expansion pressure in the cylinder has fallen not only below that equivalent to the head, but even below atmospheric pressure. The excess energy at the beginning of the expansion is thus transferred through motion of the column so that it is utilized in discharging water against a head, allowing the expanision to be complete instead of losing the energy of the exhaust at 30 or 40 lbs. above atmosphere as in ordinary gas engines, and effecting intake of water from the supply even at slight suction lift. The exhaust valves having been unlocked, are opened by springs at the end of expansion.

Second Stroke—Exhaust and Cushion: When the motion of the column



HUMPHREY GAS PUMP.

has been absorbed it comes to rest and swings back under the influence of the pressure head. The products of combustion, diluted with scavenging air, are forced out through exhaust and non-return valves until water covers the exhaust valves and closes them. The cushion of air and products of combustion trapped above these valves is compressed and the work done is sufficient to bring the column to rest. The pressure developed is greater than that due to the working head and serves to unlock the mixture valves, locking the exhaust.

Third Stroke—Rebound and Charging: The high pressure of the elastic cushion drives the water out along the play pipe once more nearly to its original level, expanding the air and drawing in a new charge of combustible mixture through spring closed automatic valves.

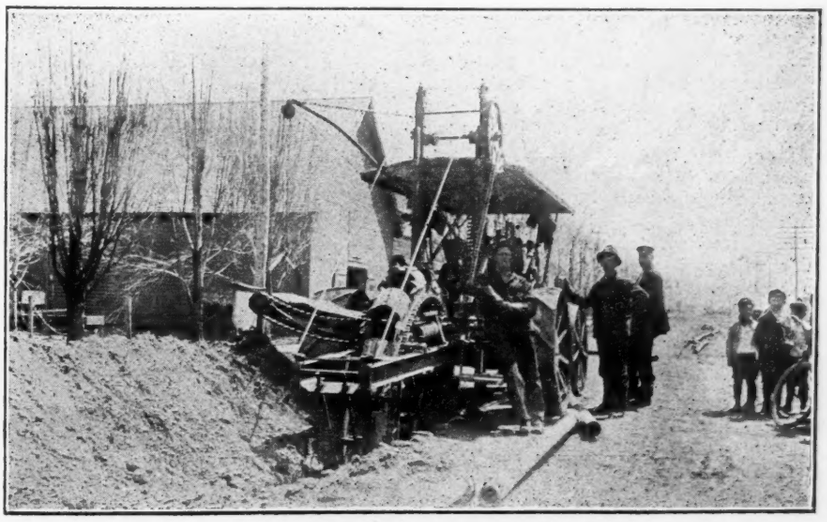
Fourth Stroke—Compression and Ignition: The column swings back for a second time under the working head and the momentum gathered during the first part of the stroke builds up the compression to a pressure much higher than that of the head itself, at which the mixture can properly be fired by the electric spark.

BUCKEYE EXCAVATOR.

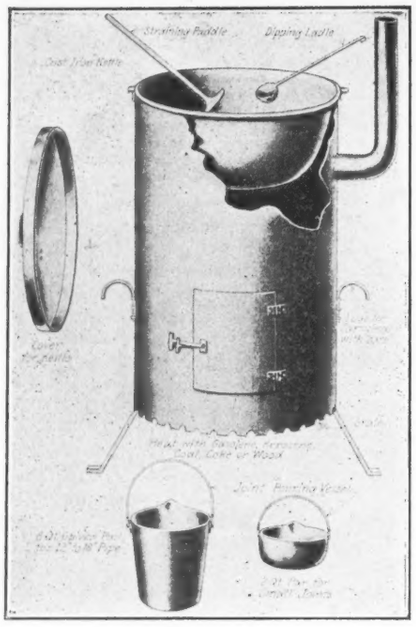
The trench excavator of the rotary wheel type, made by The Buckeye Traction Ditcher Co., Findlay, O., has been described in the Municipal Journal and the general features of its construction are doubtless familiar to its readers. A few words regarding its operation and an idea of what can be done with it from a contractor who has used it five years are interesting.

E. H. Fundom, Fletcher, O., used one of these ditchers for five years, during which time he has handled seven machines. He first used the machine as a subcontractor for water works firms and took small tile contracts. During the last two years he has become interested in drainage work and has carried out several county ditch contracts.

The machine shown in the illustration cuts trenches 15, 18, 20 and 22 inches wide up to six feet in depth.



BUCKEYE TRENCH EXCAVATOR.



APPLIANCES FOR HANDLING G-K COMPOUND.

Mr. Fletcher says that his work has been very profitable. Taking work at prices competing with hand labor he has made at times 60 per cent profit and on waterworks, as much as 75 per cent.

As to the amount of work done in a day of ten hours: On a trench 15 inches wide and 4½ feet deep the amount done has varied from 500 feet to 2,000 feet, the amount depending on circumstances. On a gas line trench 36 inches wide Mr. Fundom says he has averaged half a mile a day.

As to daily cost of operation: The operator gets $3; cost of gasoline, lubricating oil and incidentals bring the cost up to about $7, occasionally $10.

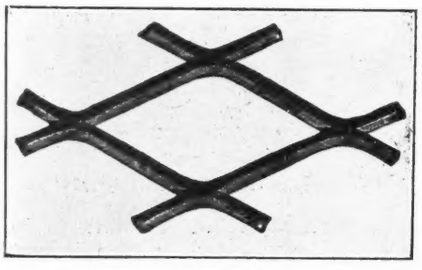
REINFORCED CONCRETE CULVERTS.

Use of Econo Steel Fabric With 3 by 8-inch Meshes.

The Northwestern Expanded Metal Co., Chicago, Ill., recommend their Econo expanded metal for reinforcing concrete culverts, bridge floors and the like. This material is produced from medium steel by a process that draws the strands at the time of expanding so that the resulting fabric has an increased strength due to the drawing process. The meshes are diamond shaped, three inches wide, and eight inches long. This size has been found after careful testing to be the most practical for it permits the use of stone up to one inch in diameter, and allows the concrete to fill the mesh without voids and to grasp the steel more effectively than any other size of mesh. Concrete will form a stronger bond with a square reinforcing member than with a round or smooth section. The strands of Econo expanded metal are square or oblong, depending on the weight of the material. One value of the diamond shaped mesh lies in the fact that it utilizes the compressive value of the concrete included in the mesh. Any tension of the fabric tends to close the mesh which is resisted by the concrete within the mesh. Practically the fabric forms a series of trusses, the concrete acting as a strut or compression member.

Circular culverts of concrete are generally made with a thickness equal to one-tenth of the diameter up to twenty inches, over twenty and up to thirty inches, the thickness is one-eighth of the diameter. For culverts with a greater diameter than thirty inches, it is possible to use reinforcing and thus reduce the amount of concrete required. The amount of concrete that would be saved by reinforcing a circular culvert of less than thirty inches in diameter will generally be more than offset by the cost of the steel.

A condition bearing on the kind of reinforcing to be used is the fact that the greatest loads passing over these culverts are concentrated loads, such as a road roller, so that a reinforcement that would be suitable for construction carrying distributed loads is not so well adapted for culvert construction. If a reinforcment consisting



ECONO EXPANDED METAL.

of units is used, it is necessary to provide a large amount of steel because the stresses are not distributed over any great area of the reinforcing.

G-K JOINT COMPOUND.

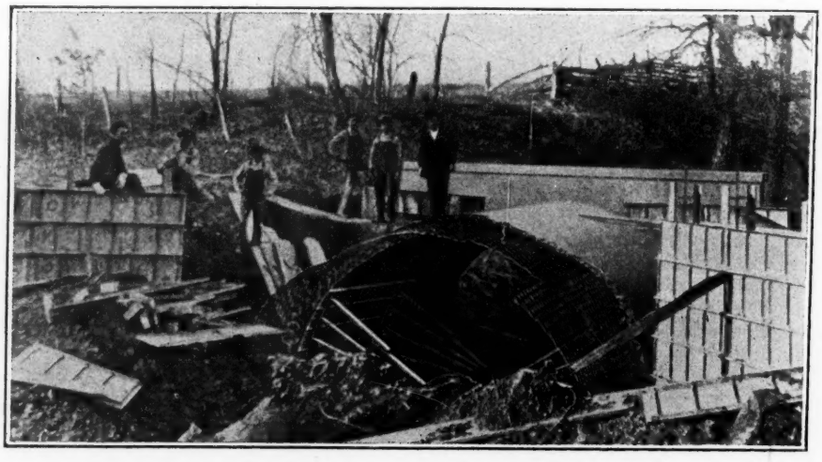
A Pliable Composition Applied in Melted Condition to Sewer Pipe Joints Making Them Water Tight.

The Union Clay Products Co., New Brunswick, N. J., are the manufacturers of G-K Water Tight Pipe Joint Compound which forms a pliable pipe joint for cast iron and vitrified tile sewer pipe. A general description of this material and the results of its use in preventing infiltration and leakage of Sanitary sewers has already been described in the Municipal Journal and is familiar to our readers.

In order to apply the material properly and economically, the Union Clay Products Company have gotten up a suitable kit of tools, shown in the illustration. It usually requires about half an hour to melt G-K to the proper consistency for pouring and for rapid work, such as jointing tile on the bank, or in dry trenches where working conditions are favorable, hence it will be found to advantage to provide a melting kettle of heavy cast iron, large enough to hold sufficient compound when half filled for 25 to 50 joints depending on the size of the tile.

For pouring small joints, a two-quart saucepan, and for larger, an eight-quart metal pail is recommended. The above, together with a small ladle for stirring and half a dozen asbestos runners for rapid work, comprises the necessary equipment for one operating crew.

County Cooperation.—The counties of Douglas, Leavenworth, Pottawatomie, Jefferson and Shawnee, Kansas, are cooperating in the purchase of road machinery. A demonstration of two grader and a steam traction engine was recently given to representatives. The Topeka Road-Metal Supply Co., of Topeka, showed the Russell Road Planer, and the Monroe Road Machine Company, of Illinois, exhibited another machine. A number of automobiles filled with officials and citizens interested, went from the nearby cities to the scene of action.



ARCH CULVERT 15-FOOT SPAN REINFORCED WITH ECONO METAL.

INDUSTRIAL NEWS

Cast Iron Pipe.—Chicago. Quotations: 4-inch, $26; 6 to 12-inch, $24; 16-inch and up, $23.50. Philadelphia: Market is quiet, but general conditions are considered as fairly satisfactory. Quotations: 6-inch, $21.50. Birmingham: Foundries are operating on good time without accumulating stocks. Quotations: 4-inch, $21; 6-inch and up, $19 New York: Considerable business is being done with private buyers, but competition is sharp. Quotations: 6-inch, $22 to $23.

Lead.—Quotations: New York, 3.80c; St. Louis, 3.675c.

Valve Service and Roadway Boxes.—The Central Foundry Company, 90 West street, New York City, has issued a new pocket size catalogue of their valve, service and roadway boxes. The variety in details of street castings is perhaps greater than many persons who deal with such articles are aware. At any rate, it is a great convenience to know exactly what are the stock sizes and what are the possible combinations that may be made in any style of box. Among the different styles are the following: Buffalo pattern, 2½ inches in diameter, the bottom sections of which vary from 12 to 51 inches and the top sections from 12 to 30 inches, making possible extensions varying from 1 foot 3 inches to 6 feet 6 inches. Similar variations are standard for 3-inch diameters. There is also a line of round or square head roadway boxes with flange bases or open bases. The shaft diameters of these may be either 4½ or 5½ inches. Bases are also made round, round dome with flange or oval. Phoenix extension roadway boxes have shaft diameters of 4¼ and 5¼ inches.

Cement Meter Boxes.—A patent was allowed February 17 to Geo. G. Haase, proprietor of the Art Concrete Works, Pasadena, Cal., for the well known cement water meter boxes used so extensively by the Pasadena water department. Other Southern California cities, such as Redlands, Anaheim, Santa Ana, Riverside and Alhambra are also using these boxes. Mr. Haase has obtained country-wide recognition from the concrete and technical magazines and engineers for the individuality, distinctiveness and usefulness of the many articles he has invented, such as the concrete wood benches used on street corners; the concrete house numbers which ornament many parkways, as well as other concrete products of merit.

Crusher.—County Highway Commissioner C. E. Moore, Janesville, Wis., has received a crusher from the Good Roads Machinery Co., Fort Wayne, Ind. It is expected that a good deal of material, such as coarse gravel and boulders, which has hitherto been wasted, will be utilized this year. The county will do $105,000 worth of new construction this year.

Municipal Asphalt Plant.—Reno, Nev., is to be owner of an asphalt mixer and in position to lay new streets and carry out repair work. The council took final steps toward the purchasing of a modern hot mixer and gasoline roller. The action was the result of the recent report of City Engineer Meskimmons and Councilman White, who visited San Jose, Cal., and made a thorough inspection of the hot mixer used in that city. It is claimed with this process and with the using of asphalt taken up from the streets, the work can be carried out at a cost of about eight cents per square foot. The city engineer was authorized by the council to purchase the hot mixer at a cost of $1,975, and a gasoline roller at a cost of $2,100, both prices being f. o. b. San Francisco.

Largest Aerial Truck.—To the Delaware Fire Company, Wilmington, Del., goes the banner for the largest aerial truck in the United States. James Boyd & Bro., Inc., Philadelphia, recently delivered to them a ninety-foot aerial ladder truck. At the delivery test the lengthy ladder towered above the highest buildings and despite its unusual length could be moved up and down and from one side to the other with ease at the will of the operator. It was raised to its full height of ninety feet in nine seconds. The members of Delaware Fire Company are very much pleased with the truck.

Private Paving Construction.—The Dunn Wire-Cut-Lug Brick Company, Conneaut, O., state that the aggregate of orders from individuals and private corporations for bricks for paving driveways and warehouse floors amounts to a large total. Licensees for Wire-Cut-Lug Brick have recently made shipments to the Yale and Towne Company, Eastman Kodak Company, Niagara Falls Power Company and others.

Motor Garbage Truck.—The Concord, N. H., board of public works recently visited Manchester to inspect the four garbage motor trucks owned by the city. These four trucks were found to have replaced almost three times as many wagons and to have effected a saving also in men.

Road Grade.—J. T. McCoombs of the Decatur Bridge Company, Decatur, Ill., has been demonstrating a large road drag called, "The Uncle Jim" in the vicinity of Galesburg, Ill. It consists of two heavy steel drags on each side of a wagon body, the drags being manipulated to any desired angle by the operator. The machine is preferably used with a tractor.

Road Machinery.—The Ohio Road Machinery Company, Oberlin, Ohio, will enlarge its plant by the erection of an addition which will double its present capacity.

Cement in Sand Cushion.—It is reported that the city of Detroit is using a small amount of cement mixed with sand cushion for laying brick pavements. This decision was reached following a paving determination test which showed brick laid on a cement and sand stood more wear, as indicated by this machine, than when laid on a cushion of sand alone.

Creosoting Plant.—The Brunswick Creosoting Company, which is being organized by Louisville men, will purchase equipment for a plant to be erected at Brunswick, Ga. James B. Wilson, of the Kentucky & Indiana Terminal Railroad Company, Louisville, will be manager. The company will be capitalized at $150,000.

Road Machinery.—The purchasing committee of Champagne, Ill., recently purchased a Twentieth Century road grader, an additional dump wagon and a street sprinkler. A pick-up street sweeper has been given a test in the business district and appears to be doing all the manufacturers claim for it.

Street Sprinkling.—The American Car Sprinkler Co., Worcester, Mass., is desirous of renewing its contract for sprinkling some of the streets of Syracuse, N. Y., at the contract price of $575 per car per week.

Crusher.—At a recent special election called for the purpose, the citizens of East Aurora, N. Y., voted to purchase a stone crusher at a cost of $1,500.

Diesel Engine. — Bush — Sulzer Brothers—Diesel Engine Company, St. Louis, Mo., has issued an attractive 112-page book entitled "The Diesel Engine." The work includes a historical sketch, illustrations of 40 installations, and a variety of valuable engineering data.

National Efficiency Exposition.

At the exposition of the Efficiency Society of New York, which was held last week at the Grand Central Palace, New York City, the Public Service Commission for the First District exhibits some of the results of its work in building rapid transit lines and in regulating corporations. Charts and maps of the dual subway system and models of some of the new stations, together with stereopticon views of the progress of construction on rapid transit work, are shown. The testing of materials entering into the construction of the subways is also practically demonstrated. Practical tests of gas meters and electric meters are made in the commission's booth, where are also displayed charts and diagrams illustrating the volume of traffic, the amount of money invested in public service corporations in New York City, and the effect of the improvements ordered by the commission. Models and photographs of new subway and surface cars are also on exhibition.

ADVANCE CONTRACT NEWS

ADVANCED INFORMATION BIDS ASKED FOR

CONTRACTS AWARDED ITEMIZED PRICES

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO

STREETS AND ROADS

Wis.,	Racine	10 a.m., Apr. 18.	Paving, curbs and gutters; various materials	P. H. Connolly, Chr. B. P. W.
Minn.,	Hutchinson	2 p.m., Apr. 18.	Grading highway	L. S. Richards, Town Clerk.
Wash.,	Tacoma	11 a.m., Apr. 18.	Paving 6.34 miles	County Comrs.
La.,	New Orleans	noon, Apr. 20.	Resurfacing highways with gravel	Board State Engrs.
La.,	Lake Charles	Apr. 20.	43 miles highways, bridges and culverts	Police Jury.
Wash.,	Olympia	Apr. 20.	12 miles highway	State Highway Board.
Iowa,	Carroll	Apr. 20.	Grading four miles; cost, $20,000	G. A. Poeppe, Co. Aud.
La.,	Bossier City	Apr. 20.	Constructing three roads, about 45 miles	W. E. Atkinson, Engr.
Ia.,	Chariton	Apr. 20.	45,000 sq. yds. pavement, various materials, and 24,400 ft. curb and gutter	G. J. Gittinger, Clk.
N. J.,	Elizabeth	Apr. 20.	Flagging sidewalks	W. P. Neafsy, St. Comr.
Cal.,	So. Pasadena	Apr. 20.	Paving 586,000 sq. ft. asphalt and asphaltic concrete	City Clerk.
La.,	Benton	Apr. 20.	Graveling main highways, about 44 miles	State Hwy. Dept., N. Orleans.
Ky.,	Louisville	2 p.m., Apr. 20.	Improving sidewalks on several streets	Board Public Works.
Minn.,	Crookston	2 p.m., Apr. 20.	20,000 cu. yds. grading; 4 miles graveling; total cost, $6,700	H. J. Welte, Auditor.
N. J.,	Jersey City	4 p.m., Apr. 20.	Macadamizing, asphalt paving and repaving several streets	M. I. Fagen, City Clerk.
N. J.,	Elizabeth	8 p.m., Apr. 20.	Improving one street and constructing sewer	City Council.
Mich.,	Flint	3 p.m., Apr. 20.	Constructing pavement	D. E. Newcomb, City Clk.
Md.,	Baltimore	noon, Apr. 21.	12 sections state highway, about 47.72 miles	W. L. Marsey, Secy.
Ia.,	Oskaloosa	8 p.m., Apr. 21.	Paving, curbing and guttering on streets and alleys	T. H. Carlin, City Clerk.
Md.,	Baltimore	noon, Apr. 21.	Resurfacing road, 1.74 miles	O. E. Weller, Ch. St. Hwy. Com.
Ind.,	Fort Wayne	10 a.m., Apr. 21.	Grading, draining and paving	P. H. Brown, Aud. Allen Co.
Ia.,	Oskaloosa	8 p.m., Apr. 21.	16,100 sq. yds. brick block pavement and 6,000 lin. ft. Portland cement concrete combined curb and gutter.	E. F. Bridges, City Engr.
Minn.,	Ivanhoe	2 p.m., Apr. 21.	One road grader, 18 drags, 2 plows, 6 scrapers and 4 slips.	K. A. Hanson, Aud.
Pa.,	Lansdowne	8 p.m., Apr. 21.	Constructing curb and gutters	J. W. Davis, Sec'y.
Del.,	Wilmington	Apr. 21.	Macadamizing 7 miles	State Highway Comn.
N. Y.,	Gloversville	Apr. 21.	Concrete and brick pavement	H. J. Hammer, City Engr.
Pa.,	Sharpsville	6 p.m., Apr. 21.	12,000 sq. yds. brick pavement	W. A. Graber, Sec.
Iowa,	West Union	Apr. 21.	28,000 sq. yds. paving, various materials	R. P. Camp, City Clerk.
Ill.,	Taylorville	2 p.m., Apr. 22.	Improving 13 streets	Board Local Imp.
Kan.,	Pittsburg	8 p.m., Apr. 22.	Guttering, grading, paving, etc	L. Boyd, City Clk.
Conn.,	Hartford	2 p.m., Apr. 22.	Paving 27 sections of highway, about 33 miles	State Hwy. Comn.
O.,	Cincinnati	noon, Apr. 22.	Constructing main and lateral sewers, five jobs	Director Public Service.
Wis.,	Two Rivers	Apr. 22.	Grading, curbing and macadamizing streets	Board Pub. Works.
N. Y.,	Brooklyn	11 a.m., Apr. 22.	Constructing granite pavement on 6-inch concrete foundation	L. H. Pounds, Boro. Pres.
Minn.,	Mankato	3 p.m., Apr. 23.	20,400 ft. road	C. L. Kennedy, Aud.
O.,	Hopewell	noon, Apr. 23.	Macadamizing highways	C. Snyder, City Clk.
O.,	Tiffin	1 p.m., Apr. 23.	Macadamizing various roads	C. Snider, Clk.
Ind.,	Bluffton	10 a.m., Apr. 23.	Constructing stone road	Co. Comrs.
N. J.,	West Long Branch	8.30 p.m., Apr. 23.	Grading one street	F. A. Poole, Boro. Clerk.
Minn.,	Elbow Lake	10 a.m., Apr. 23.	Road work, culverts, etc., $11,690	O. E. Wold, Aud.
Minn.,	Duluth	noon, Apr. 24.	60,000 sq. yds. paving, 17,000 ft. curb, 130,000 sq. ft. sidewalk, 80,000 sq. ft. housewalks, etc	Morell & Nichols, 902 Palace Bldg., Minneapolis.
N. Y.,	Albany	1 p.m., Apr. 24.	Furnishing and delivering for Schenectady broken stone.	J. N. Carlisle, Comr.
Minn.,	Mora	10 a.m., Apr. 24.	Constructing county roads, about 11 miles	A. Peterson, Co. Aud.
Kans.,	Leavenworth	Apr. 24.	8.365 sq. yds. vit. brick pavement, cost $13,574	J. B. Frank, City Engr.
Wis.,	Janesville	2 p.m., Apr. 24.	Improving several streets	Board Public Imp.
Minn.,	Grand Rapids	10 a.m., Apr. 24.	Constructing county road	M. A. Spang, Aud.
Neb.,	Omaha	noon Apr. 25.	Grading streets	F. Dewey, Co. Clk.
Mich.,	Crystal Falls	Apr. 25.	Building 5 miles new earth road	County Road Committee
Minn.,	Owatonna	11 a.m., Apr. 25.	Constructing state rural highway: cost, $17,048	M. J. Parcher, Co. Aud.
Ohio,	Fostoria	noon, Apr. 25.	Paving two streets with brick or asphalt block	C. Latsham, Chief Engr.
Tex.,	Dallas	Apr. 25.	Paving viaduct and constructing 3 bridges, cost $125,000.	J. M. Preston, City Engr.
W. Va.,	Moundsville	4 p.m., Apr. 25.	Curbing and paving with vit. brick	O. B. Bonar, Clerk.
Minn.,	Owatonna	Apr. 25.	Rural highway, cost $17,048	Co. Auditor.
O.,	**Urbana**	**Apr. 26.**	**22,500 sq. yds. pavement**	**Bd. Pub. Service.**
Cal.,	Sacramento	Apr. 27.	Constructing 30 miles state highway	State Comrs.
Minn.,	Wadena	3 p.m., Apr. 27.	5½ miles clearing, grading, $5,792	E. Boss, Aud.
La.,	Lake Charles	Apr. 27.	Paving about 43 miles highways; bridges and culverts	Co. Police Bureau.
Minn.,	Minneapolis	11 a.m., Apr. 27.	Grading and macadamizing 8,700 ft. road	A. P. Erickson, Co. Aud.
N. Y.,	Elmira	11 a.m., Apr. 27.	Grading, curbing and paving with vit. block, 21,000 sq. yds.	L. C. Andrews, City Clk.
Ill.,	Chicago Heights	8 p.m., Apr. 28.	57 554 sq. yds. vit. brick pavement, concrete foundation and curb, $153,423	M. H. McCoy, Engineer.
S. D.,	Columbia	10 a.m., Apr. 28.	60,000 sq. yds. street paving, various materials; also concrete or granite curbs	J. McNeal, City Engr.
Minn.,	Buffalo	Apr. 28.	30 drags, 8 slip scrapers, 8 plows, 16 shovels and metal culverts	J. A. Berg, Co. Aud.
Minn.,	Cambridge	1 p.m., Apr. 28.	7½ miles road work	G. C. Smith, Aud.
Minn.,	Bird Island	1.30 p.m., Apr. 28.	Austin-Western, etc, road graders, tractor hitch, plows, about 4 dump wagons	J. L. Johnson, Aud.
Conn.,	Waterbury	8 p.m., Apr. 28.	Paving with split granite block	R. A. Cairns, City Engr.
Ind.,	Indianapolis	10 a.m., Apr. 29.	Culverts, bridges, etc	Board Co. Commrs.
Wash.,	Olympia	Apr. 29.	Constructing about 12 miles state highway	W. H. Roy, State Hwy. Bd.
N. J.,	Passaic	2 p.m., Apr. 29.	Macadam repair work	Chosen Co. Freeholders.
N. J.,	Paterson	Apr. 29.	Repairing, macadamizing, etc., several roads	Co. Bd. Chosen Freeholders.
Minn.,	Borup	2 p.m., Apr. 29.	2½ miles road grade, also dragging	J. L. Arends, Clk.
Ill.,	Elgin	about May 1.	Paving, various materials, about 14,000 sq. yds	A. Fehrman, Mayor
N. Y.,	Utica	May 1.	4,500 ft. bituminous macadam road	E. M. Swigget, Supt.
O.,	Cincinnati	noon, May 1.	Repairing county road	County Commissioners.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
N. J.,	Newton	May 1.	Improving 10 miles highway; cost, $100,000	H. Snock, Co. Engr.
Wis.,	Watertown	May 1.	Eight blocks of paving, probably cement	F. S. Webber, City Clk.
D. C.,	Washington....2 p.m.,	May 1.	Supplying asphalt paving block, vit. paving blocks, sewer invert bricks, etc.	District Commrs.
Tenn.,	Seiverville.....noon	May 1.	Grading 60 miles; macadamizing 30 miles	Co. Rd. Comrs.
Ind.,	Greenfield	May 4.	Furnishing and delivering grades of crushed stone	Co. Comrs.
N. C.,	Rocky Mount	May 5.	40,000 sq. yds. paving, various materials; also 10 miles sewer and gas pipes	Board of Aldermen.
Pa.,	Harrisburg.....10 a.m.,	May 5.	Highway work, including pavement, etc., five jobs	E. M. Bigelow, State Hwy. Comr.
Minn.,	Hibbing.....8 p.m.,	May 6.	Graders, dump wagons, wheel scrapers, slushers, and metal culverts	V. J. Benoe, Clerk.
N. D.,	Northwood....6 p.m.,	May 6.	Sidewalks and street crossings	G. P. Johnson, City Aud.
Ind.,	Fort Wayne	May 6.	Grading, draining and paving	C. H. Brown, Co. Aud.
O.,	Cincinnati.....noon,	May 8.	Improving pike	Co. Comrs.
O.,	Montpelier	May 12.	15,000 sq. yds. paving	Village Clerk.
O.,	East Liverpool .....noon,	May. 15.	Paving with brick or paving blocks; eight jobs	E. J. Smith, Dir. Pub. Ser.
O.,	Coshocton .....about	May 15.	1½ miles brick and slag road	J. R. Marker, Comr., Columbus.
O.,	Canal Dover.....about June	1.	Constructing brick pavement	W. E. Sykes, Dir. P. S.

SEWERAGE

Me.,	Portland.....6 p.m.,	Apr. 18.	Constructing sewer main	Selectmen of Parish.
Ind.,	Green Castle ....3 p. m.,	Apr. 18.	20-inch tile drain, 7,518 ft	Drainage Comr.
Okla.,	Sulphur	Apr. 18.	Sanitary sewer, cost $50,000	City Council.
Wis.,	Sheboygan .....4 p.m.,	Apr. 18.	Construction sewer system	Board of Public Works.
Me.,	South Paris.....6 p.m.,	Apr. 18.	Furnshing pipe, catch basins, manholes, etc	Selectmen.
Ind.,	Greencastle.....3 p.m.,	Apr. 18.	7,518 ft. 20-inch tile drain	Clerk of Putnam Co.
N. J.,	Jersey City.....4 p.m.,	Apr. 20.	Reconstruction of sewer	M. I. Fagen, City Clerk.
Minn.,	E. Grand Forks.8 p.m.,	Apr. 20.	Lateral sewers in various streets	J. Gorman, City Clk.
Sask.,	Swift Current	Apr. 20.	Sewer and water works constructions	G. D. Arnott, City Clk.
Ill.,	Rankin .....1.30 a. m.,	Apr. 20.	Sewer system, cost $20,000	Board Local Imp.
Ala.,	Birmingham	Apr. 21.	4 miles 6-inch clay pipe sewer, 51 manholes	J. Kendrick, City Engr.
N. D.,	Fargo.....5 p.m.,	Apr. 21.	Sewer and water connections	A. R. Watkins, City Aud.
Ind.,	Chesterton	Apr. 21.	Constructing sewer system	C. W. Cole, Engr. Mishawaka.
Mass.,	Nantucket	Apr. 21.	2 miles sewers	R. S. Weston, 14 Beacon St., Boston, Mass.
N. J.,	So. Orange.....8 p.m.,	Apr. 21.	Constructing sewer pipes and flush tanks	Township Committee.
N. Y.,	Brooklyn....11 a.m.,	Apr. 22.	Constructing sewers in several streets	L. H. Pounds, Boro. Pres.
Mass.,	Fitchburg	Apr. 22.	Constructing two sections of intercepting sewer	B. A. Hartwell, Ch. Sew. Disp.
Kans.,	Pittsburg	Apr. 22.	Constructing lateral sewer	L. Boyd, City Clk.
Mass.,	Franklin	Apr. 23.	Filtration, reservoirs, sewers, etc	Sewer Comrs.
Sask,	Saskatoon .....noon,	Apr. 23.	Storm and sanitary sewers	F. E. Harrison, Mayor.
Minn.,	Mankato.....3 p.m.,	Apr. 23.	Corrugated culvert pipe	C. L. Kennedy, Co. Aud.
O.,	Canal Fulton.....noon,	Apr. 27.	Constructing sanitary sewer	J. V. Duggan, Clk.
Mich.,	Highland Park	Apr. 27.	19,650 ft. 36 to 54-in. sewers and 36 manholes	Village Clk.
Minn.,	Duluth.....3 p.m.,	Apr. 27.	County ditch; cost, $40,507	O. Halden, Auditor.
Wis.,	Ripon.....4 p.m.,	Apr. 27.	875 feet sewer	J. W. Pierce, Clerk.
Minn.,	Bemidji.....10 a.m.,	Apr. 28.	Constructing judicial ditch; cost, $311,000	J. L. George, Co. Aud.
Minn.,	Crookston.....10 a.m.,	Apr. 28.	Contructing ditch; cost, $11,710	H. J. Welte, Aud.
N. J.,	Newark.....2 p.m.,	Apr. 28.	Constructing intercepting sewer	J. S. Gibson, Clk. Comn.
N. J.,	Paterson.....2 p.m.,	Apr. 28.	Main intercepting sewer	J. S. Gibson, Clk., Newark.
Idaho,	Mountain Home	Apr. 30.	Sewer system, cost $24,725; septic tanks, $1,500	O. E. Norell, City Clk.
W. Va.,	Bluefield	Apr. 31.	Installing 17,000 ft. sanitary sewers	J. T. Akers, Aud.
Iowa,	Sheffield	May 1.	Constructing water work and sewer system	City Clerk.
N. J.,	Newark.....2 p. m.,	May 5.	Foundations and connections for pumping station	J. S. Gibson, Clerk.
O.,	Canton	May 5.	Constructing sewage disposal plant	R. W. Platt, Engr., Cleveland
N. J.,	Ventnor City	May 6.	Intercepting sewer, centrifugal pumps, sewage disposal works, etc.	Common Council.
Ia.,	Sumner	May 6.	Four miles sewers	City Clerk.
N. Y.,	Goshen.....1.30 p.m.,	May 15.	Sewer system and sewage disposal plant	G. F. Gregg, Vil. Pres.

WATER SUPPLY

Minn.,	New Ulm .....5 p.m.,	Apr. 18.	4,370 ft. 6-in. water main	A. J. Myer, City Clerk.
Sask.,	Swift Current	Apr. 20.	16,000 ft. combined water works and sewer extension	City Clerk.
O.,	Cincinnati	Apr. 20.	Cleaning c.-i. pipe, special castings, etc	City Clerk.
Del.,	Wilmington	Apr. 20.	8,000 ⅝-inch meters; 500 ¾-inch meters and couplings for same	City Clerk.
Neb.,	Long Pine	Apr. 20.	Constructing 24-ft. diameter standpipe, 40 ft. high	Village Bd. Trustees.
Utah,	Salt Lake City.10 a.m.,	Apr. 20.	Water main extension, etc	L. P. Palmer, County Clerk.
Neb.,	Long Pine.....8 p.m.,	Apr. 20.	Standpipe, 24-foot diameter, 50 feet high	Board Trustees.
N. Y.,	Poughkeepsie.2.30 p.m.,	Apr. 20.	Installing protection for intake supply	J. H. B. Hannify, Sec. Hospital Comn., Albany.
N. Y.,	Brooklyn.....10 a.m.,	Apr. 21.	Iron pipe and fittings	Navy Dept., Washington, D. C.
N. Y.,	New York.....11 am,	Apr 21.	Constructing 11 superstructures along aqueduct	Board of Water Supply.
O.,	Cleveland .....Noon,	Apr. 21.	Constructing concrete mixing chambers, coagulation basins, filtering and main piping	Comr. Pur. & Sup.
Minn.,	White Bear....7 p.m.,	Apr. 21.	Water mains	J. E. Extrand, Vil. Clk.
Pa.,	Hamburg .....2 p. m.,	Apr. 22.	Water and sewer system in sanatorium	S. G. Dixon, Comr. of Health Harrisburg.
D. C.,	Washington.10.30 a.m.,	Apr. 22.	Steel, iron and lead pipe fittings, valves, etc	Maj. F. C. Boggs, G. P. O., Isthmian Canal Comn.
Kan.,	Herington.....8 p.m.,	Apr. 23.	Extension and improvement to waterworks system	C. E. Lower, City Clk.
Pa.,	Easton.....10 a.m.,	Apr. 24.	Laying pipes and making connections with standpipe	Co. Comrs.
Mich.,	Midland	Apr. 24.	Municipal water works system	D. M. Bye, Clerk.
Mont.,	Billings	Apr. 25.	Ingot iron galvanized culverts	City Clerk.
Fla.,	Wauchula.....1 p.m.,	Apr. 25.	Constructing water works and sewer systems	Bond Trustees.
La.,	Hammond	Apr. 27.	C. i. pipe, hydrants, specials, etc	J. H. Rathfon, Controller.
Pa.,	Philadelphia	Apr. 28.	Pumping machinery, boilers, tanks, etc	M. L. Cook, Dir. P. W.
Ont.,	Brantford	Apr. 30.	Two 4-million gallons turbine pumps and two motors, etc	Sec.-Treas., Bd. Water Comrs.
Ia.,	Sheffield	May 1.	Constructing water works and sewer system	City Clerk.
O.,	Wooster .....about	May 1.	Water works improvement	R. H. Hunter, City Engr.
Ala.,	Clinton	May 1.	Installing water works system	City Clerk.
Ia.,	Sheffield	May 6.	Water works and sewer system, cost $28,000	A. C. Shafer, City Clk.
Sask.,	Estevan .....8 p. m.,	May 9.	Laying water main and constructing sewers	P. J. Stephans, Sec.-Treas.
La.,	Hammond .....2 p. m.,	May 9.	Improvements to water system	City Comrs.

LIGHTING AND POWER

O.,	Hamilton .....10 a.m.,	Apr. 18.	Lighting fixtures for court house	W. W. Crawford, Co. Aud.
O.,	Amelia	Apr. 18.	Constructing works for generating and transmiting electricity	Village Clerk.
W. Va.,	Warwood	Apr. 20.	Constructing power house and plant	U. S. Engrs.
Ind.,	Indianapolis	Apr. 20.	Ten-year lighting contract	J. T. Jeup, City Engr.
W. Va.,	Wheeling	Apr. 20.	Fireproof power house; one 115 horse-power boiler	Maj. J. P. Jervey, Corps. Engrs., U. S. A.
Mass.,	Holyoke.....2 p.m.,	Apr. 21.	Coke conveyor and crushing plant; gem and tungsten lamps	Gas & Elec. Dept.
N. Y.,	Brooklyn.....10 a.m.,	Apr. 21.	Electrical supplies	Navy Dept., Washington, D. C.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Kan.,	Pittsburg	Apr. 22.	Furnishing 175 poles, combined trolley and lighting standards, lamps, globes, etc.	L. Boyd, City Clerk.
N. J.,	Atlantic City	Apr. 23	Illuminating city	Commissioners.
Ill.,	Urbana	2 p.m., Apr. 27.	Electric wiring, heating, etc., of chemical laboratory	Trustees Univ. of Ill.
S. D.,	Aberdeen	Apr. 27.	Electric light fixtures	Co. Aud.
Del.,	Wilmington	noon, Apr. 28.	Incandescent street lighting for five years	L. V. Christy, Secretary.
Mass.,	Holyoke	2 p.m., Apr. 28.	Electric meters and gas meters	Gas & Elec. Dept.
S. D.,	Elk Point	2.30 p.m., Apr. 30.	Electric lighting system	A. Smythe, City Aud.
O.,	Cleveland	May 4.	Installing heating and ventilating apparatus in 3 schools	Clk., Board Education.
Pa.,	Philadelphia	May 7.	Contract for electric street lighting	Dir. Cooke.
B. C.,	Fernie	May 7.	Complete tungsten street lighting system	J. E. Finn, Sup. Lt. & Power.
			FIRE EQUIPMENT	
Mass.,	Medford	Apr. 19.	1,000 ft. 2½-inch single jacket fire hose	C. F. Bacon, Chief.
N. J.,	New Brunswick	7 p.m., Apr. 20.	2,000 ft. fire hose	Fire Committee of Council.
W. Va.,	Bluefield	Apr. 24.	One combination chemical and hose, and one motor ladder truck	J. T. Akers, City Aud.
D. C.,	Washington	Apr. 27.	Furnishing and installing new boiler and rebuilding engine	Purchasing Officer.
Wash.,	Puget Sound	10 a.m., May 5.	Quantity of linen fire hose	Navy Dept., Washington, D. C.
			BRIDGES	
W. Va.,	Clarksburg	10 a. m., Apr. 18.	Concrete bridge, 580 ft. long	City Council.
N. Y.,	Ogdensburg	2 p.m., Apr. 18.	Constructing reinforced concrete bridge	N. Wells, Town Clerk.
Tex.,	Houston	2 p.m., Apr. 20.	Constructing bridge	B. Campbell, Mayor.
O.,	Hamilton	10 a.m., Apr. 23.	Constructing bridge, steel or concrete	W. W. Crawford, Co. Aud.
O.,	Cincinnati	noon, Apr. 24.	Bridge construction	Board Co. Comrs.
Minn.,	Buffalo	1.30 p.m., Apr. 28.	Corrugated metal culverts	J. Berg.
Ont.,	Cayuga	May 2.	Concrete arch bridge	Township Council.
Tex.,	Houston	10 a.m., May 4.	Constructing reinforced concrete bridge, 150 ft. long	H. L. Washburn, Co. Aud.
			MISCELLANEOUS	
Ill.,	Chicago	11 a.m., Apr. 18.	3,000 cubic feet sand; plumbing and sewerage at playground; 200 steel garbage boxes	L. E. McGann, Comr. P. S.
N. J.,	Deal	Apr. 18.	Removal of ashes, garbage, etc., for three years	H. D. Harris, Borough Clerk.
N. J.,	Jersey City	4 p.m., Apr. 20.	One or more 2-passenger runabouts; rattan corporation push brooms; pointing up city hall, and furnishing playground apparatus	M. I. Fagen, City Clerk.
Ill.,	Chicago	Apr. 20.	Iron spiral stairway	L. E. McGann, Comr. Pub. Wk.
Ill.,	Chicago	11 a. m., Apr. 20.	Steam-driven concrete mixer, Batch type	L. E. McGann, Comr. Pub. W.
Cal.,	San Francisco	Apr. 20.	50,000 barrels Portland cement	State Board Harbor Comrs.
D. C.,	Washington	10 a.m., Apr. 21.	Railway track, turn tables and side dump cars	Bureau Supplies & Accounts, Navy Dept.
Ill.,	Chicago	11 a.m., Apr. 22.	One induce draft apparatus	L. E. McGann, Comr. P. S.
Pa.,	Williamsport	1 p.m., Apr. 24.	1,000 bbls. Portland cement	County Comrs.
N. Y.,	New York	12.15 pm., Apr. 24.	Building part of rapid transit railway	Pub. Serv. Comn, 1st Dist.
N. Y.,	Brooklyn	2.15 p.m., Apr. 24.	Constructing part of subway	Public Service Comn.
O.,	Lorain	noon, Apr. 27.	Constructing subway	L. B. Johnson, Clerk.
Ill.,	Des Plaines	Apr. 27.	Erecting two wings to school, cost $50,000	Board Education.
W. Va.,	Wheeling	Apr. 28.	700 bbls. American Portland cement	Maj. J. P. Jervey, Corps. Engrs., U. S. A.
Wash.,	Puget Sound	10 a.m., Apr. 28.	Steel bolts, brass pipe fittings, reducing valves, etc	J. T. Cowie, Paymaster, U. S. N., Washington.
Pa.,	Wanamie	7 p.m., Apr. 28.	Combination street sprinkler and sweeper	W. O. Davis, Secy.
Cal.,	San Francisco	Apr. 29.	Marble work in City Hall, cost about $400,000	Board Pub. Works.
Ill.,	Chicago	11 a.m., Apr. 30.	Constructing two freight and passenger buildings	E. C. Shankland, Harbor and Subway Comm.
Mo.,	Richmond	May 1.	Constructing court house; cost, $100,000	J. J. Pardue, Co. Treas.
Ark.,	Little Rock	3 p.m., May 1.	Alterations in post office and court house	O. Wenderoth, Sup. Architect, Washington, D. C.

STREETS AND ROADS

Tombstone, Ariz.—Board of Supervisors has decided to pave Bisbee-Warren highway. Sum of $40,000 has been set aside for this purpose from county road fund.

Tucson, Ariz.—Resolutions ordering paving done on Stone Ave. and grading of North Main St. have been passed, city engineer being instructed to advertise for bids on each of them, and resolution of intention to grade 12th St. between 6th Ave. and 3d Ave. has also been passed.

Chico, Cal.—Supervisors will be asked to use emergency fund of Butte County to contribute $7,000 towards making state highway 30 ft. wide for entire length of Esplanade, distance of one and three-tenths miles, instead of 18 ft. wide. It is estimated that cost of paving Esplanade as proposed will be about $30,000, of which state will pay $23,000.

Hayward, Cal.—City Clerk will advertise for paving of Simon St.

Oakland, Cal.—The asphalting of San Pablo Ave., from Emeryville town line to Berkeley line will now be rushed to completion, as City Council has granted permission to City Street Improvement Co. to do the work. Contracts for oil-macadamizing School St., between 35th and Fruitvale Aves.; 85th Ave., from East 14th St. to Moss tract; Santa Rosa Ave., between Chetwood and Jean Sts; Chetwood St. north of Santa Rosa Ave.; Laguna Ave., between Madeline and Carmel Sts., and Delmar St., between Laguna and Lincoln Ave., have also been awarded by City Council.

Pasadena, Cal.—Construction of new road through Bell and Coyote pass is being considered.

Pasadena, Cal.—Four streets have been ordered paved.

Sacramento, Cal.—Three million dollars' worth of state highway bonds have been sold by State Treasurer Roberts. Among counties that took bonds were following: Tehama Shasta, and Butte, $800,000; Solano, $150,000; Orange, $200,000; Alameda, $200,000. Other counties and the State Board of Control took the balance. Bids were opened by California Highway Commission for construction of aggregate of 39 miles of roads in Humboldt, Santa Clara, Merced, San Diego and El Dorado counties, to cost approximately $210,000.

Sacramento, Cal.—Bids for construction of 30.8 miles of highways have been opened by State Highway Commission, as follows: Tuolumne County, from the westerly boundary to Keystone, 10.8 miles, to be graded. Estimate, $46,684.30; materials furnished by state, $2,019.26. Cyrus and William Moreing, Stockton, $71,963; Richard Rothwell, Los Angeles, $95,354; Booker & Newell, Jamestown, $55,739.20. Mendocino County, from Forsythe Creek to Ridgewood, 6.5 miles, to be graded. Estimate, $59,223.85; materials furnished by state, $4,967.70. J. D. Niman & Sons, Turilock, $59,283.50; H. L. Petersen, San Francisco, $65,896.50; Ashby & Moncure, Ripon, $51,793.75; Berry-Mackie & Co., San Francisco, $51,656.90; Shattuck-Edinger Co., San Francisco, $77,673.75; Hard Brothers, Sacramento, $51,381.70. San Diego County, from Las Flores to westerly boundary, 11.5 miles, to be constructed of Portland cement concrete. Estimate, $74,852.35; materials furnished by state, $24,354.30. W. A. Perry, Los Angeles, $69,935.83; Lynn S. Atkinson, Los Angeles, $92,361; John D. Marsh, Los Angeles, $84,569.45; Rogers Brothers, Los Angeles, $108,054.95; H. E. Cox, Pasadena, $98,085.95; Ernest S. Shields, San Diego, $79,873.90; C. L. Hyde Construction Co., San Diego, $84,584; Richard Rothwell, Los Angeles, $101,483.50; Leigh Garnsay, Los Angeles, $100,043.85. San Diego County, from East San Diego to La Mesa, 2 miles, to be constructed of Portland cement concrete. Estimate, $12,620.96; materials furnished by state, $6,779.68. Holland Construction Co., San Diego, $12,461.50; C. L. Hyde Construction Co., San Diego, $11,741.90.

Sacramento, Cal.—Bids for construction of 26.8 miles of roadway in Humboldt, El Dorado, Santa Clara and Merced counties, aggregating expenditure of $171,078.15, have been opened by State Highway Commission. Bids follow: Humboldt County, from Section one to southerly boundary line, about 4.5 miles to be graded. Esctimate, $54,219.05; materials furnished by state, $7,744.60. Berry Mackie & Company, San Francisco, $45,097.10; Hard Brothers, Sacramento, $53,240; Fairbanks & Boechtil, Willits, $54,756.50; Isaac C. Allen, San Francisco, $43,922.80; G. W. Conners, Eureka, $64,687. El Dorado, from El Dorado to Placer, about 6.5 miles, to be built of macadam. Estimate, $50,894.98; materials furnished by state, $10,395.95. Lyon, Burke & Hughes, Placerville, $59,056.50; Cyrus & Will Moreing, Stockton, $78,354.50. Santa Clara County, from San Jose to Mulia, about 1.8 miles, surfaced with asphaltum concrete. Estimate, $14,618.74. John W. McDonald, San Jose, $15,869.60; Ransome Crummey Company, Oakland, $17,940.20. Merced County, from Merced to southerly boundary line, about 14 miles, to be constructed of Portland cement concrete. Estimate, $51,350.38; materials furnished by state, $63,152.28. Taylor & Barliner, Los Angeles, $52,902; Richard Rothwall, Los Angeles, $60,583.

Stratford, Conn.—The Stratford Selectmen have ordered several streets in town surveyed and later on many of our streets will be laid out for all time.

Dover, Del.—Amount of money available for improvement of Kent County's roads during present year has been fixed at $60,000, including $10,000 bond issue authorized by Kent County Levy Court.

Washington, D. C.—Maryland Ave., between 6th and 13th Sts., northeast, is to be provided with a central parkway. Orders for improvement have been issued by engineer department of District and work will be started within two or three weeks. Street now has width of 60 ft. Plans for new arrangement call for two 24-ft. roadways and parkway 12 ft. wide.

Avon Park, Fla.—Petition is being circulated for calling election for voting on good roads.

Eustis, Fla.—Town Council has ordered four cars of Interlachen gravel for experimental block of road building. This material will be laid on Center St. and will give Eustis two blocks of hard surfaced roadway.

Atlanta, Ga.—Public Works Committee of Board of Fulton County Commissioners is preparing to lay 50,000 yds. of bitulithic pavement in city during spring and summer.

Trenton, Ga.—Dade County has voted $60,000 bond issue for constructing pike from Tennessee Boundary Line to Alabama Line.

Bloomington, Ill.—Petition has been received by Board of Local Improvements for pavement on North Clinton St., from Emerson to Division Sts.

Chicago Heights, Ill.—City has advertised for about 57,554 sq. yds. vitrified brick pavement, with asphaltic filler on 2-in. sand cushion on 6-in. concrete foundation; also 5,800 ft. of 6-in. concrete curb and 27,260 ft. of 5-in. concrete curb, together with considerable amount of header, curb and crossing, curb, total estimate being $153,423. M. H. McCoy, Engr.

Bedford, Ind.—County Treasurer Earl G. Short, of Lawrence County has sold $3,000 worth of 4½ per cent., nontaxable Marshall township gravel road bonds to T. F. Parr & Co., of Chicago, at premium of $15 and accrued interest.

Fort Wayne, Ind.—Board of Works has adopted resolution and approved plans presented by city engineer for widening and straightening of State St., from Parnell Ave. to State St. bridge. Thoroughfare will be made fifty-five feet wide.

Hartford, City, Ind.—Petitions have been granted for improvement of certain streets under 3 mile road law.

Indianapolis, Ind.—Board of Public Works has ordered B. J. T. Jeup, city engineer, to prepare plans and specifications for paving number of streets. Work contemplated will cost about $200,000. One of most important improvements is paving East New York St., from Arsenal Ave. to point near Gale St.

Lafayette, Ind.—Specifications for street oiling have been decided upon by Board of Public Works and bids for oiling contract will be advertised for immediately.

Laporte, Ind.—Road bonds for building of Carlson Road in Galena Township and of Cass Road in Cass Township have been sold by County Treasurer. Amount of bonds for Carlson Road is $21,200 and were sold to G. L. Payne & Co., of Indianapolis. Cass Road bonds went to E. F. Parr & Co., of Chicago.

South Bend, Ind.—Bids will be received by Board of Park Commissioners until April 17 for construction of asphaltic concrete pavement, with patent concrete curb and gutter on St. Louis St. Blvd., from South Bend Ave. to Corby St.

Council Bluffs, Ia.—An estimate of cost of paving North Broadway and South Ave. from ends of connecting streets paved at present to city limits has been submitted to City Council meeting as committee of whole. Total cost will be $72,052.20. Estimate was prepared by City Engineer E. F. Stimson. The cost of paving South Ave., Tostevin St., Graham Ave. and High St. will be $32,791.70, according to estimate. Cost of paving Broadway is placed at $34,260.70, and cost of repairing Indian Creek bank for paving will be $5,000.

Des Moines, Ia.—Iowa brick for surfacing many of Iowa roads is being considered.

Carlisle, Ky.—A movement has been started to build model road through Nicholas County, from Bath County line to Millersburg. Nicholas County Fiscal Court in session has decided to appropriate $10,000 to be used in event citizens of Nicholas County raised $10,000 to be used on model road.

Jeffersonville, Ky.—County Treasurer John R. Scott of Jeffersonville has sold to Gavin L. Payne & Co. of Indianapolis $14,700 worth of free gravel road bonds for purpose of securing funds to improve what is known as Luther F. Warder road in Jeffersonville Township.

Baltimore, Md.—Riverside Ave. in South Baltimore will shortly be resurfaced.

Baltimore, Md.—Involving, approximately, 132,000 sq. yds. of sheet asphalt, besides about 93,000 cu. yds. of grading, bids for one of largest paving contracts in history of city will be opened in few days before regular meeting of Board of Awards. Work will involve estimated cost of $300,000. Bids have been asked for by Commissioners for Opening Streets and are divided into three separate contracts—Nos. 129, 130 and 131. Work will improve 47 streets in northern section of Annex, none of which has ever been paved.

Cumberland, Md.—At meeting of Board of Road Directors order was passed and signed by members of Board requesting County Commissioners to issue last $10,000 worth of bonds under Shoemaker Act.

Hagerstown, Md.—Construction of road from Smithsburg via Ringgold to Pennsylvania State line is being considered.

Boston, Mass.—Following loan orders have been passed at first reading, second and final to take place fourteen days from date: $500,000 for new streets; $150,000 for high pressure water service; $4,000, playground in Ward 2; $600,000, sewerage works; $400,000, separate system of drainage in Charles River Basin. Loan order was passed second and final reading for $500,000 for widening following streets: Chelsea St., $100,000; Norfolk St., $100,000; Centre St., $100,000; Hyde Park Ave., $60,000; Beacon St., $50,000; Faneuil St., $50,000; Amory St., $40,000. Loan order appropriating $42,000 was passed final reading, sum to be expended in widening Washington St. to uniform width from Warrenton St. to Pleasant St.

Gloucester, Mass.—Improvement of Vincent St. is being considered.

Gladwin, Mich.—Bonds in sum of $25,000 have been carried for road building.

St. Paul, Minn.—Park Board has passed order allowing property owners $120,000 damages along route of the Mound Park Blvd. for right of way purposes.

Seminary, Miss.—Highway Comn. will sell additional $15,000 bonds for 37 miles of gravel roads.

Atlantic City, N. J.—Following are bids received for paving of Baltic Ave. In complete list of bids M. C. Burns Paving Co. appear low for granite paving, at $131,993, The Holland-Donnelly Co., of this city, are low for vitrified brick, at $101,397.50, and Richard Lamb Co., of New York, are low on wood block paving, at $108,738.60. Bids will be considered by Commissioners and award made. Other bidders and their prices are as follows: William J. Rodgers, vit. brick $105,354, wood block $119,810.60, granite block, $138,234.60; Grannis & Warley, vit. brick $103,716.20; C. T. Eastbourne, vit. brick $106,379.10, wood block $126,438.50; Richard Lamb, wood block $108,738; T. J. McGovern, vit. brick $115,609.40, wood block $127,701, granite block, $146,073; Union Paving Co., vit. brick $107,092.20, wood block $120,366.30, granite block $141,849.20; McNichol Paving Co., vit. brick $107,901.80, wood block $126,752.70, granite block $139,730.30; Holland-Donnelly Co., vit. brick $101,397.50, wood block $114,010.30; Kelley-McFeeley Co., vit. brick $103,338.90, wood block $117,489.30, granite block $140,942.90; M. C. Burns, vit. brick $106,288.50, wood block $121,035, granite block $131,993; Sutton & Corson, vit. brick $108,239.40, wood block $114,329.25, granite block $138,719.30; Ruch & Curran, vit. brick $114,645.80, wood block $132,079.20; granite block $153,699.30; Edward L. Bader, vit. block $103,853.80, wood block $111,202.60, granite block $134,473.80; American Paving Co., vit. brick $120,371.80, wood block $142,664.40, granite block $162,567.40; Hassan Paving Co., vit. brick $105,375.30, wood block $124,053.50, granite block $140,588.30.

Elizabeth, N. J.—Plans have been made for immediate improvement of various streets. Contracts for paving Emma St., from Spring to Henry St.; Lafayette St., from Jaques to Reid St., and South Park St., from Fifth to Sixth St., will be awarded in few weeks.

Long Branch, N. J.—Mayor Arthur F. Golden and members of West Long Branch Borough Council are planning number of street improvements. Old Lippincott road, which connects Wall St. with Long Branch-Eatontown stone road, is to be graded and afterward gravelled.

Newark, N. J.—It is planned to repave Court St., from Washington to High Sts., with granite blocks, also Jelliff Ave., Duryee St. Baldwin and Longworth Sts. are to be paved.

Newton, N. J.—Road improvement bonds in sum of $42,000 have been sold by Board of Freeholders.

Passaic, N. J.—An ordinance has been passed to lay asphalt bound macadam upon Burgess Pl., between lands of Erie Railroad Co. and westerly limits of city.

Pulaski, N. Y.—Town Superintendent of Highways Dexter M. Lilley has been authorized by Town Board of Richland to proceed with work of improving town roads, for which upward of $5,000 will be expended. Other towns outside of Richland which have made agreements with County Superintendent of Highways Howard, including amounts to be expended for highway improvements, are following: Albion, $1,365.42; Amboy, $1,268.51; Boylston, $1,216.10; Constantia, $3,200; Granby, $3,891.62; Hastings, $3,603.55; Hannibal, $3,500; Mexico, $4,671.42; New Haven, $3,985.35; Orwell, $2,050; Oswego town, $3,500; Palermo, $2,433.38; Parish, $2,762.99; Redfield, $2,795.37; Richland, $4,495.42; Sandy Creek, $3,285.05; Schroeppel, $3,563.60; Scriba, $3,037.74; Volney, $3,050; West Monroe, $2,179.43; Williamstown, $2,026.40.

Rochester, N. Y.—To build 30 miles of good roads in this county at cost of about $300,000 is recommendation made by Board of Supervisors to State Highway Commission, and it is expectation that work of building will be begun soon and finished before the Fall season. Roads to be improved and their lengths are: Mendon Center Road, in Mendon, changed from circling the hills to a straight route over them—4 miles; Lawless Paper Mill Road, in Perinton, 1¼ miles; Greece-Parma Town Line Road, half in each town, 8½ miles; Fitch Road, Riga and Wheatland, 6¼ miles; Buckbee Corners-North Chili Roadñ in Chill, 2½ miles; East Henrietta Road, in Henrietta, 4¼ miles; Morton Road, in Hamlin, 2½ miles. Board of Supervisors also voted to appropriate $4,500 for repairs on West Side Boulevard.

Lovelady, N. C.—Bonds in sum of $25,000 for road work have been sold.

Raleigh, N. C.—Steps are being taken by people on road between Cary and Raleigh, now under construction, to bring about its oiling. Supervisor Wiggs says cost of oiling the 8½ miles will be about $500.

Winston-Salem, N. C.—Election will be held for voting on $50,000 bond issue for curbing and grading streets.

Cincinnati, O.—Widening of Butler St. from Pearl to 3d is being considered.

Cleveland, O.—C. W. Courtney, Engineer, 1150 Leader Bldg., Cleveland, would like literature, etc., from manufacturers of bituminous binders, flush coats cement manufacturers and other who manufacture materials which could be used with gravel in road construction. Contemplates building of from 15 to 20 miles of improved roads within next few years.

Columbus, O.—Bids will be received at office of Board of County Commissioners until 10 a. m., April 30, for purchase of Franklin County road improvement bonds for improvement of Stimmel Road and King Ave. John Scott is Clerk of Board.

Fostoria, O.—Bids will be received until April 25 for about 12,500 sq. yds. paving and 9,000 lin. ft. curbing. E. K. Cunningham is Director of Public Service, and Chas. Latsham is Chief Engr.

Marion, O.—The Bucyrus-Upper Sandusky pike, from fork of roads about two miles north of Marion to corporation line, distance of about a mile, is to be repiked by state as market road. Total cost, approximately $8,000, is to be paid by state, which is also to keep it in repair.

Salem, O.—Columbiana County Commissioners have formally voted $13,000 of $26,000 to $30,000 which this county will receive this year from state aid fund, to pay for half of 1¼ miles of paving to be placed this year, extending from Salem city line to West Perry Township line on Damascus Road. This will pave road entirely to Country Club entrance.

Salem, O.—County Commissioners have passed resolution authorizing improving of 2¼ miles of roadway south from Columbiana or what is known as Fairfield and Elkton road.

Albany, Ore.—The Albany Commercial Club is preparing plans to submit bonding proposition to voters of Linn County asking for issue of $750,000 for pur-

pose of building hard-surface roads. Project covers 100 miles, and will connect nearly every town in county with standard hard-surface road.

Chester, Pa.—Ordinance has been passed providing for paving of roadways of 24th St., from end of present brick pavement thereon southwestwardly to line of Borough of Upland; and of 9th St., from Highland Ave. westwardly nine hundred (900) feet; and from point on 9th St. nine hundred (900) feet west of Highland Ave. to West City Line, with asphalt, bitulithic, filbertine, Warrenite, amiesite, wood-block, vitrified brick or block, or any other improved, modern, smooth hard and durable street paving material. J. H. Mirkil is City Clerk.

Harrisburg, Pa.—See "Sewerage."

Lebanon, Pa.—Ordinance is being considered for bond issue of $14,000 for paving of street intersections

Lewistown, Pa.—The $28,000 loan for municipal improvements has passed final reading in council and will go before voters for approval. This means that Dorcas St. will be opened and bridge erected over Kishascoquillas Creek built; South Main St. will be paved, closing gap in 5½ miles of State highway between Mifflin and Huntingdon.

New Kensington, Pa.—City Council has voted to spend about $80,000 on paving and sewer improvements.

Newport, Pa.—Borough Council will act on proposed paving of Market St., from Center Square to Fourth St., April 13.

Shenandoah, Pa.—Election will be held for voting on bond issue of $74,000 for completion of street paving.

Wilkes-Barre, Pa.—Ordinance has been passed authorizing paving of Chestnut St. between North Main and North River Sts.

Williamsport, Pa.—Bond issue ordinance, authorizing issue of $23,000 worth of bonds to cover borough's share of paving of Southern Ave., has passed third and final reading.

Providence, R. I.—Councilman Austin of Second Ward will introduce resolution in Common Council authorizing Commissioner of Public Works to purchase combination heater and pressure distributor, auto truck type, and appropriating $630 therefor. Resolution will be introduced in connection with report relative to estimated cost of oiling macadam streets and also for treatment of paved streets for purpose of dust prevention.

Providence, R. I.—Board of Contract and Supply has opened bids for paving portion of Smith St. There were two bidders, Narragansett Improvement Co. and Edward Balf Co., Hartford, Conn. Figures on various items of work were respectively as follows: Narragansett Improvement Co., removing old pavement, 15 cts. per square yard; laying new, 93 cts.; laying creosote blocks, $2.50; laying sheet asphalt, $1.25; Edward Balf Co. removing old paving, 25 cts.; laying new, $1.10; laying creosoted blocks, $2.65; laying sheet asphalt, $1.60.

Providence, R. I.—The installation of system of street oiling for macadamized highways of city and of flushing for paved streets at total first-year cost of about $150,000 has been recommended in report sent to Common Council by committee on highways.

Dayton, Tenn.—Rhea County voters have decided to issue $250,000 in bonds for purpose of building first-class roads.

Humboldt, Tenn.—Gibson County Court at its April term will be asked to vote appropriation of $10,000 to be used in building two highways across county—one extending from Humboldt to Kenton and other from Milan to Eaton, both passing through Trenton.

Knoxville, Tenn.—By vote of 167 to 64 Oakwood, incorporated suburb of Knoxville, has voted for bond issue of $50,000 first bond issue since town was incorporated. Half money will be spent for school building and other on streets and sewers.

Bonham, Tex.—At meeting of good roads advocates held in Bonham, it was decided to petition Commissioners Court to orde ranother election for bond issue for good roads in this district.

Corsicana, Tex.—The $400,000 good roads bonds have been sold to J. A. Thompson, of Corsicana.

Fort Worth, Tex.—According to estimates of Commissioners, $167,000 will be needed to meet immediate requirements of city for Allen Ave. viaduct and other improvements which are to be made. Main St. repaving will cost $30,000; Houston St. extension repaving, $10,000; Allen Ave. viaduct, including paving, $22,000; Cardinal road terminals, $25,000; storm sewers, $70,000; Jennings Ave. and other street repairs, $10,000.

Houston, Tex.—Resolutions have been passed ordering drawing of plans and specifications for paving of Polk from Milam to Smith, Wilson from Andrews to San Felipe, Andrews from Heiner to Wilson and Robins from Smith to Heiner. Mayor will shortly advertise for bids for paving work.

Houston, Tex.—Appropriation of $2,100 has been made for paving of Taylor from Washington to the Houston and Texas Central tracks.

San Antonio, Tex.—Bids received for wood paving blocks have been rejected.

Waco, Tex.—The Attorney General's Department approved following bonds for city of Waco, totaling $200,000. They were distributed as follows: Street improvement, $65,000; public park, $60,000; bridge repairs, $50,000; storm sewers, $15,000; sanitary sewers, $10,000.

Bingham, Utah.—At meeting of Town Board it was decided to pave all of streets of town with bitulithic paving. Contract will involve from $65,000 to $75,000.

Salt Lake City, Utah.—Resolution has been passed setting aside certain streets of city for boulevard purposes.

Chatham, Va.—Board of County Supervisors has confirmed sale of $50,000 Dan River District road improvement bonds which completes voted issue of $100,000 at election held in that district last year. Harris, Forbes & Co. were purchasers.

Olympia, Wash.—Treasurer Will Hanna of King County has secured $50,000 from state for King County good roads under agreement consummated last fall.

Fond du Lac, Wis.—County Board has made contract for road machinery which will cost $6,428.75.

Janesville, Wis.—Highways throughout county will need immediate attention according to County Highway Commissioner C. E. Moore, who urges town chairmen and road inspectors to have county roads as well as other highways gone over with road drags as early as conditions will permit.

Racine, Wis.—Bids have been received for paving of Thurston Ave., which is a $19,000 job. Three bidders were James Cape & Son, brick, $2.14 per sq. yd.; curb and gutter, 58 cts.; Western Improvement Co., asphalt, $1.95; brick, $2.05; asphaltic concrete, $1.75; curb and gutter, 58 cts.; Birdsall-Griffith, brick, $2.07; curb and gutter, 60 cts.

CONTRACTS AWARDED.

San Francisco, Cal.—By Board of Works, to City Street Improvement Co., contract for paving with asphalt about two miles of Junipero Serra Boulevard, company's bid amounting to $48,865. Strip to be paved will be 25 ft. wide. Six-inch concrete base will be laid, and it is believed that good road will be made.

Ottawa, Ill.—The West Ottawa paving contract has been awarded to John Cherry, of Jacksonville, at special meeting of city council and Board of Local Improvements. Cherry's bid was $268,-311.27.

Indianapolis, Ind.—It is said contract will be awarded to M. J. McCarthy for sprinkling unimproved streets of city this season. Following are bids received: M. J. McCarthy, Districts Nos. 1 and 2, water, $20.25; Chloride, $130; light oil, $110, and tar, $145; Districts Nos. 3 and 4, water, $19.45; chloride, $130; light oil, $110, and tar, $145. Kentucky Asphalt Road Co., Louisville, Ky., District No. 1, light oil, $89.97; tar, $149.97; District No. 2, oil, $89.97; tar, $149; District No. 3, oil, $83.53, or $88.53, both amounts being given in separate places; tar, $147; District No. 4, oil, $88.53; tar, $147. Germer & Henry, District No. 1, water, $20.90; chloride, $34; light oil, $76. Frank Kennington, District No. 1, water, $24.50; chloride, $42; oil, $90; District No. 2, water, $25; chloride, $43; oil, $95; District No. 3, water, $23.75; chloride, $39; oil, $87; District No. 4, water, $23.75; chloride, $38; oil, $87. Henry Fuehring, District No. 2, water, $20.60; chloride, $47.45; light oil, $84.45; tar, $105.45.

Richmond, Ind.—To Daniel Burkhardt, contract for construction of cement roadway in first alley south of Main St., from 11th to 14th St., on bid of 14¾ cts. per ft.

Terre Haute, Ind.—Four contracts have been let by Board of Public Works for improvement of sections of as many streets. Streets for which contracts were let are as follows: Schaal Ave., between 25th St. and Brown Ave., to Weaver, Carpenter & Weaver, of Brazil, on a bid of $13,864.40; 8th St., between Hulman and Vorhees, to Weaver, Carpenter & Weaver, on a bid of $12,551.94; 13th St., between College Ave. and Hulman St., to Ernest Berns, of Linton, on bid of $12,785.80. These three streets will be paved with reinforced macadum.

Algona, Ia.—Contract has been awarded to the Ford Paving Co., Cedar Rapids, Ia., for Lake asphalt with granite at $1.53 per sq. yd., and to J. S. McLaughlin & Sons, Red Oak, Ia., for concrete with limestone at $1.24 per sq. yd. for alley pavement and approaches. Theo. S. De Lay is Civil Engr.

Algona, Ia.—Lowest bidder for curbing work was J. S. McLoughlin & Sons, Red Oak, Ia., at following bid: 3,000 ft. curb and gutter for street pavement, straight curb, at $0.60, total $1,800, and for 25,500 ft. curb and gutter for street pavement, park curb, at $0.58, total of $14,790. Other bidders were Capitol City Conc. Con. Co., Springfield, Ill; Aiken & Flutter, Ames, Ia.; R. A. Parsons, Des Moines, Ia.; C. F. Lyttle, Sioux City, Ia.; Bryant Asphalt Co., Waterloo, Ia.; Des Moines Asphalt Paving Co., Des Moines, Ia.; C. B. McNamara, Dubuque, Ia.; Lord Paving Co., Cedar Rapids, Ia., and W. G. Birdsall, Perry, Ia.

Boone, Ia.—To Des Moines Asphalt Paving Co., Des Moines, at following bid: 61,000 sq. yds. asphaltic concrete, $1.54½; 16,000 ft. cement curb, 37 cts.; 1,000 ft. curb to reset, 22 cts.; extra grading, per cu. yds., 47 cts.

Corning, Ia.—City Council has opened bids for paving for this season, and awarded contract to P. C. Flutter at $1.96 per sq. yd. for brick paving, $1.34 per yd. for concrete or alley paving, 74 cents per lin. ft. for curb and gutter, and 40 cents per yd. for the excess grading. This year there will be 10,000 sq. yds. of brick paving, 2,200 sq. yds. of concrete paving, 7,000 ft. of combined curb and gutter, and about 1,100 yds. of grading. Paving will consist of thirteen blocks of street and four blocks of alley paving.

West Union, Ia.—By City Council, for paving, to Sweeny Bros., Reedsburg, Wis., as follows: 29,665 sq. yds. vitrified block, $2.07; 6,000 lin. ft. 7-in. curb and gutter, $1.29; 5,690 lin. ft. 18-in. curb, 35 cts.; total, $71,138. Totals of other bidders on vitr. block: J. Lee, Dubuque, $73,872; F. K. Hahn, Cedar Rapids, $76,088; Dearborn Constr. Co., Waterloo, $79,243; G. J. McIntyre Co., $109,323; Ford Paving Co., Cedar Rapids, $78,332; Wm. Horabin, Iowa City, $72,502; Turner Improv. Co., Des Moines, $82,023; McLaughlin & Son, Red Oak, $75,283; Elzy & Carlson, Marshalltown, $81,295; C. B. McNamara, Dubuque, $77,606.

Great Beach, Kan.—By city to J. R. Ramsey, Lawrence, Kan., contract for laying about 17,000 sq. yds. of asphaltic concrete paving. H. A. Rowland, Mgr., McPherson, Kan.

Hutchinson, Kan.—Contract has been let to James Haston to clay county road north from Salem Church, in Walnut township. It is a mile of bad sand road and will now be put in good shape.

Leavenworth, Kan.—To E. W. Geiger Construction Co., of Salem, Ore., contract for paving of Sixth and Seventh Sts. This company was lowest bidder for work. J. J. Brown was awarded contract for furnishing city with cement during year at $1.80.

McPherson, Kan.—By city contract for laying about 38,000 sq. yds. asphaltic concrete paving to Standard Roofing Co., Tulsa, Okla. H. A. Rowland is City Engr.

Ottawa, Kan.—For paving of 13 blocks of streets, contracts for macadam work has been awarded to N. E. Stucker. For macadam work totals of expense on each street were as follows: N. E. Stucker, tarvia binder, $18,693.08; asphalt binder, $18,815.74; asphaltic cement, $19,306.38. Ransom & Cook, tarvia or asphalt binder, $20,183.85. Matter of contract for brick work was left open for a week. It will be seen by consulting following that Ransom & Cook's bids for sand or grout filler are lowest, while that of Mr. Stucker is lowest for pitch filler. Bids for this class of work are as follows: Ransom & Cook, sand filler, Cedar, $5,168.36; W. 6th, $3,345.96; total, $8,514.32; grout filler, Cedar, $5,430.06; W. 6th, $3,515.16; total, $8,945.22; pitch filler, Cedar, $5,691.76; W. 6th, $3,684.36; total, $9,376.12. N. E. Stucker, sand filler, Cedar, $5,213.82; W. 6th, $3,397.24; total, $8,611.06; grout filler, Cedar, $5,475.52; W. 6th, $3,566.44; total, $9,041.96; pitch filler, Cedar, $5,632.54; W. 6th, $3,667.96; total, $9,300.50.

Hickman, Ky.—To Sam Wilson for grading 77 miles at $12.40 per mile.

Lexington, Ky.—Contracts for putting of practically 1,200 rods of crushed rock on portion of roads of Fayette County have been awarded by road committee of fiscal court. Bids were received and contracts let for roads embraced in

groups 1 and 6 to Lute & Darnell for $1.27 per ton. In group No. 1, the roads embraced and the number of rods of rock to be spread upon roads are as follows: Parkers Mill road, 400 rods; Bowman's Mill road, 100 rods; 10 rods on one mile of the Ryman's Mill road. Group 6, 300 rods on the Georgetown pike; 5 rods of concrete stone on the Sandersville pike; same on Greendale pike; 10 rods of rock on Spurr pike, and 25 rods on Kearney pike. Roads embraced in group No. 10 have been awarded to Woodward Brothers of Wilmore at $1.20 per ton and contain following pikes: 160 rods of rock on the Richmond pike; 100 rods on the Walnut Hill pike; 160 rods of rock on lower end of Tates Creek pike.

New Orleans, La.—For paving with creosote blocks road from Clouet to Alvar St., to J. R. Stiehle, New Orleans, at about $26,000, and for constructing 5 miles of Arkansas highway in Caddo Parish near Shreveport by Highway Department State Bd. Engineers, to W. P. Ritchie, Camden, Ark., at $16,775.

Baltimore, Md.—For paving about 47 streets in northern section of the Annex some of the bids were as follows: For Contract No. 129, Warner-Quinlan Asphalt Co. bid $1.59 a sq. yd. for asphalt. For Contract No. 130 new company, Union Paving Co., of Hartford, Conn., bid $1.68 a sq. yd. for asphalt as compared with bid of $1.69 a sq. yd. by Baltimore Asphalt Block & Tile Co. For Contract No. 131, which consists entirely of grading, following bids were offered: The Standard Paving & Contracting Co., 38½ cts. a cu. yd.; Patrick Flanigan & Sons, 39 cts. a cu. yd. All of bids were referred to Commissioners for Opening Streets for tabulation.

Preston, Md.—For 1½ miles of state road from Preston to Linchester to J. S. Bond, of Baltimore.

Bozeman, Mont.—By City Council, contract for paving Grand Ave. south, to Warren Bros. Construction Co., of Portland.

Morristown, N. J.—Sands, Kline & Co. and the A. L. A. Manufacturing Co., both local concerns, were given contract to furnish oil for streets, their prices being 7 cts. per gallon. Board decided to divide oiling contract equally between bidders, each firm furnishing 20,000 gallons, as both firms had bid same amount.

Morristown, N. J.—Contracts have been awarded by Board of Aldermen for paving with amiesite of eight streets, total cost of which will be $12,842.94. John Gougherty, Fred S. Smith and Osborne & Marseillas were successful bidders.

Newark, N. J.—By Board of Public Works to Ralph Sangiovanni, contract to pave Warren St. between South 9th and Orange Sts., with reclipped granite blocks.

Westfield, N. J.—To Weldon Contracting Co., general contract for repair of streets. Charles G. Peterson was awarded contract to lay cement sidewalks in several sections.

Albion, N. Y.—Rhody & Slawson have been given contract to construct 1.81 miles of brick pavement in South Ave., this village, for $68,260. Road is part of trunk line route No. 30 and is known as contract No. 5448. Next lowest bidder was E. R. Reed & Son, of Holley, at $70,595.60.

Binghamton, N. Y.—By Board of Contract and Supply contract for paving Court St. bridge to A. D. Osborn at $2.38 a sq. yd., repressed wood block manufactured by Wood Preserving Company to be used.

Hudson, N. Y.—The Catskill Construction Co. has received contract for constructing Cairo-Windham state road, part 2, length 2.44 miles. Their bid was $31,892.90. Lowest bidder was Caesar A. Rossi of Torrington, Conn., whose bid was $31,357.90.

Syracuse, N. Y.—Proposals have been received by Board of Contract and Supply for furnishing city with portable asphalt paving plant and other equipment for repairing pavements under system adopted by administration that city do work rather than award contract. Board already has awarded contract for carload of asphalt to Warner-Quinlan Asphalt Co., and it is planned to start work within few weeks. For portable plant, bids were received on four alternative specifications. The Rapid Mixer Co.'s proposals were $1,785.20 with tools, and $1,729.20 without tools. W. J. Cullen bid $1,911 with tools and $1,740 without tools. The Warren Brothers Co. submitted two bids, one at $4,925 and other at $5,000 on different specifications. Three proposals were submitted for furnishing asphalt roller weighing five tons. Under ordinance adopted by Common Council, giving permission to buy roller at not to exceed $2,500, either one may be accepted. Lowest bid was $1,450 for steam roller by Barber Asphalt Paving Co. Lowest bid for gasolene roller was $1,950 by Austin Western Road Machine Co. Other proposal was by Buffalo Steam Roller Co. at $2,035. Bids for concrete were received, lowest being $1.58 a barrel for Millen cement by F. P. McCarthy.

Akron, O.—By State Highway Department, to the J. C. Devine Co. of Alliance, O., for constructing of Akron-Kent road, at $25,240. The H. E. Culbertson Co. of Cleveland submitted same bid. Other bidders on job were McShaffrey & Son, Akron, $25,334.67; McGarry & Stowe, Akron, $25,250; Patrick J. O'Brien, Riff Road, Canton, O., $25,500; and Ule & Fletcher, Kent, O., $25,435.

Columbus, O.—Contracts for $300,000 worth of road improvements have been awarded by State Highway Commissioner's Department. Contracts call for work to be completed by August and cover following improvements: Delaware County—Paving of macadam, Trenton Road, Trenton Township, 1.90 miles; estimated cost, $11,286.42. Fulton County—Macadam with glutrin surface treatment, Archbold Fayette Road, Graham Township, 1 mile; estimated cost, $8,870.59. Fulton County—Glutrin surface treated macadam, Archbold-Fayette Road, German Township, 1 mile; estimated cost, $8,372.55. Hamilton County—Macadam and concrete, Dunlap-Springdale Road, Colerian Township, 3.1 miles; estimated cost, $40,304.61. Lawrence County—Macadam, Upper Township, 1.27 miles; estimated cost, $13,910.50. Portage County—Brick, Ravenna - Parkham Road, Freedom Township, 3.94 miles; estimated cost, $62,767.73. Alternative bids will also be received for paving with concrete, estimated cost of construction, $49,044.15. Summit County—Brick, Akron-Kent Road, Talmadge Township, 1.17 miles; estimated cost, $25,839.57. Scioto County—Brick Ohio River Road, Porter Townshpi, 1.45 miles; estimated cost, $30,025.54. Wayne County—Brick, Akron-Wooster Road, Green Township, 1.50 miles; estimated cost, $23,940.90.

Youngstown, O.—Contract for 75,000 gallons of oil for the 85 miles of macadam road in district comprising Youngstown, Austintown, Jackson and Boardman townships, has been awarded by Good Roads Commissioners to Indian Refining Co. for 4.24 cts. a gallon, making total cost of $3,180. This was lowest bid of six submitted, there being difference of 2 cts. between lowest and highest prices. Commission plans to make two applications of oil, one early in season and another about middle of summer.

Chester, Pa.—To J. & J. Hanna for brick sidewalks, as follows: New curb and setting, 73 cts. per lin. ft.; new pavement, 72 cts. per sq. yd.; resetting old curb, 10 cts. per lin. ft.; repairing old sidewalks with new bricks, 52 cts. per sq. yd.; repairing old sidewalks with old bricks, 15 cts. per sq. yd.; repairing old sidewalks with new foundation, 23 cts. a sq. yd.; grading and filling, 24 cts.

Pittsburgh, Pa.—By County Commissioners contracts to Pihl & Miller to furnish creosote wood block for 17 county bridges at $8,535. Contracts for similar material for eight bridges was let to F. F. Shellenberger for $5,432.

York, Pa.—For laying cement pavement the General Supply & Construction Co. bid 10 cts. a sq. ft., Thomas C. Wolf 12 cts., and A. B. Kraft 10 cts. For laying brick pavements, A. B. Kraft bid 7 cts. a sq. ft. Action on these bids was deferred, the bids of A. B. Kraft and the General Supply and Construction Co. being the same. For laying of cement curbs the General Supply & Construction Co. bid 25 cts. a lin. ft., Thomas C. Wolf 30 cts. and A. B. Kraft 25 cts. Action was also deferred here because lowest bids were alike. For delivery of common brick the General Supply & Construction Co. bid $7 per 1,000, C. E. Miller $6, Frey Bros. $6.50 and the York Shale & Pressed Brick Co. $6.25. Contract was awarded to the York Shale & Pressed Brick Co. For paving brick, delivered, the General Supply & Construction Co. bid $25 per 1,000, George A. Barnitz $24.90, and Frey Bros. $26.50. There were also bids under this same head from C. E. Miller at $7.50 and from the York Shale & Pressed Brick Co. at $7.25, but City Engineer Warner explained that these were grades of brick not suitable for street paving. Contract was let to the George A. Barnitz Co. For furnishing hard limestone east of George St., Schum & Ruhl submitted the only bid, 90 cts. a perch. As there were no others contract was not awarded. For furnishing hard limestone York Stone & Supply Co. bid $1.10 a perch east of George St. and 95 cts. west of George St; the Hartley-Ziegler Co. bid $1.15 east of George St. and $1.04 west of George St., and Schum & Ruhl bid $1.10 east of George St. and $1.25 west of George St. The contracts for both sides of the city were let to the York Stone & Supply Co.

Wilkes-Barre, Pa.—Contract for supplying city with 40,000 gallons of road oil has been awarded to Warner-Quinlan Co. at 4.292 cts. per gallon upon recommendation of Mr. Loveland.

Dallas, Tex.—Contract for paving Garrett Ave. from Monarch St. to city limits has been awarded to Standard Engineering Co. on bid of $777.72.

Dallas, Tex.—By County Commissioners' Court, contract for supplying culverts for county road work for next six months, to Wyatt Metal Works. Estimate for next six months will run about $6,000.

Galveston, Tex.—For delivering 4,000 cu. yds. of mudshell which is to be used in repairing shelled streets of city, to Hanson's Sons, at price of $3,000.

Houston, Tex.—For paving of Harrisburg road, to Eureka Construction Co.

Humptulips, Wash.—By State Highway Board, Olympia, for improving 7.8 miles Olympic highway between Humptulips and Quinalt, to N. A. Jones Constr. Co., Tacoma Bldg., Tacoma, at $42,985.

Olympia, Wash.—By State Highway Board, contract to N. A. Jones Construction Co., of Tacoma, for clearing, grading and draining stretch of Olympia highway south of Lake Quiniault, in Chehalis County. Contract price for 8⅛ miles of road work is $42,985.

Woodland, Wash.—For hard surfacing three streets, to Hayden Bros., Portland, Ore., at $17,350. Next lowest bidders are Alfred & James, Centralia, $18,244; Jeffry & Bufton, Portland, $18,245; Consolidated Contr. Co., Portland, Ore., $20,750.

London, Ont.—By City, for 125,000 gals. asphalt road oil to British-American Oil Co., Toronto, at 6½ cts. per gal., and Barber Asphalt Co., 7.7 cts. per gal. Wm. H. Ashplant is City Engr.

SEWERAGE

Daytona, Fla.—Bids will be received by Board of Public Works of Daytona, Fla., until 2 o'clock p. m., May 5, 1914, at its office in Daytona, for purchase of $125,000 of gold five per cent. sewerage and drainage bonds of city of Daytona.

Rockville, Ind.—Legislature which recently adjourned, enacted law authorizing Mayor and Council to issue bonds not to exceed $50,000 for sewerage system, but law is not mandatory. Present Mayor and Council will, it is understood, employ engineer to make surveys and prepare specifications.

Paducah, Ky.—Contract for topographic survey and drawing of plans and specifications for proposed third district sewer has been awarded to Aetna Engineering company of Chicago, Ill., by special committee for city. Contract price is $3,000.

Boston, Mass.—See "Streets and Roads."

Fall River, Mass.—Sewer construction work to amount of $53,000 has been recommended by Aldermanic Committee on Sewers. Of original $250,000 special sewer loan negotiated a year ago, approximately $120,000 has already been expended. A few weeks ago loan of $60,000 was ordered and this will cover work now recommended. Balance of about $70,000 will then be available, and it is expected that most of this will be used up this summer.

Willimansett, Mass.—Petition will be presented to Board of Aldermen asking that Fairview be provided with sewerage system.

St. Paul, Minn.—After revising plans for Ocean street sewer system by eliminating several laterals Board of Public Works has reduced estimate to $51,000 and adopted favorable report on order.

Three Forks, Mont.—Election will be held April 23 for voting on $45,000 worth of bonds for municipally owned sewer system and water works plant.

Elizabeth, N. J.—Ordinances have been adopted for construction of sewers in various streets.

Passaic, N. J.—Ordinance has been passed to lay sanitary sewer in Brook Ave. between Passaic Ave. and High St.

Plainfield, N. J.—Bond issue of $250,000 has been authorized by North Plainfield Common Council for sewer construction. One hundred thousand dollars of this is for joint trunk line sewer, and $150,000 is for collecting system of sewers.

Plainfield, N. J.—Sale of $30,000 worth of sewer bonds has been authorized.

Trenton, N. J.—Senate has passed Assemblyman Barbour's bill extending Pas-

saic Valley trunk sewerage system by including boroughs of Prospect Park and Haledon.

Dunkirk, N. Y.—Council has approved plans submitted for lateral sewer in Doughty St., and declared its intention to construct lateral sewer in and along Doughty St., between Lord St. and Hoyt St., discharging into Hoyt St., to be built in accordance with plans and specifications prepared by city engineer.

Goshen, N. Y.—Trustees of village will receive bids until May 15 for construction and completion of system of sewers and sewage disposal plant as per plans prepared by Engineer Clyde Potts, 30 Church St., New York City. Work consists of about 10 miles of vitrified pipe sewers, sizes, from 8 to 18 ins., together with sewage disposal works and necessary appurtenances.

Middletown, N. Y.—Plans are being prepared by Johnston & Fuller of New York City, for construction of sewage disposal plant.

Schenectady, N. Y.—City is about to float bond issue of $300,000 for completion of sewage disposal plant and also for building of portion of sewers which will be necessary when plant is operated.

Winston-Salem, N. C.—Election will be held for voting on $50,000 bond issue for sewerage disposal plant.

Salem, O.—Ordinance has been passed by Council determining to proceed with construction of sanitary sewer along West Main St., from Depot St. to trunk line sewer east of Pennsylvania tracks. Sewers will be constructed along both sides of street between curb and property lines. At railroad it will connect with trunk line sewer.

Dallas, Ore.—Election has been called for May 26 to vote upon question of issuing bonds for $7,500 for building septic tank sewage disposal plant and for $5,000 to purchase site for Polk County Fair.

Erie, Pa.—Ordinance has been passed providing for construction of 15-in. pipe storm water drain in Chestnut St., from 19th to 25th St.

Harrisburg, Pa.—Issuance of $140,000 of municipal improvement bonds authorized last fall has been decided upon at meeting of Sinking Fund Commission. Issue will be advertised at once, and bids asked for at four per cent. Bids will be received on April 20 and bonds will be turned over to purchasers May 15. Issue calls for $55,000 for parks and playgrounds; $50,000 for sewers; $25,000 for municipal street repair plant; $10,000 for new fire apparatus.

Lebanon, Pa.—Plans have been completed for sewerage system on north side.

York, Pa.—Ordinance for construction of additional storm water sewers, for which $25,000 is appropriated under pending $200,000 loan bill has passed finally without opposition. Bill authorizes construction of storm water sewers on various highways.

Fayetteville, Tenn.—Fayetteville citizens have voted overwhelmingly to issue $60,000 bonds for purpose of installing sewer system.

Fort Worth, Tex.—See "Streets and Roads."

Galveston, Tex.—City Engineer Dickey has reported estimates of laying new sewer laterals. Total cost of work will be about $7,218.90. Board has ordered that bids be advertised for at once.

Houston, Tex.—Specifications for construction of storm sewer on Eagle Ave. from Main to Fannin have been approved and Mayor authorized to advertise for bids for its construction.

Houston, Tex.—Sum of $25,500 has been appropriated by city council for completion of Fourth Ward storm sewer.

Waco, Tex.—See "Streets and Roads."

CONTRACTS AWARDED.

New Haven, Conn.—To Antonio Lambo, Waterbury, for constructing North Front St., at $28,045.

Laporte, Ind.—To William Reinhart, of Laporte, for building of Factory St. sewer at $2,998.

Richmond, Ind.—To Contractor Hipskind, contract for constructing sewer system in Center St., from Second to Fifth, on bids of $4.19 per lin. ft. for 42-in. main, and $150 per ft. for 15-in. main.

South Bend, Ind.—Contract for sewer connections on Ford St. and St. Louis boulevard to Henry Devos of South Bend.

Baltimore, Md.—For sanitary contract No. 123, to David M. Andrea Co., of Baltimore, at $50,262.75.

Franklin, Mass.—Contracts have been awarded as follows: 340 sets manhole castings, to Sessions Foundry Co., Bristol, Conn., $2,343; 56,352 lin. ft. 4 to 24-in. Ohio vitr. pipe, 940 Y branches, 250 bends, and 1,000 stoppers, to C. H. Spring Co., Newton Lower Falls, $11,101; 20,760 lin. ft. 4 to 24-in. c.-i. pipe and special castings to Warren Foundry & Machine Co., Boston, $30,694; sluice gates and gate boxes, Chapman Valve Mfg. Co., Boston, $1,536.

Grand Island, Neb.—For construction of sewer in district No. 42 to Grand Island Plumbing Co.

Morristown, N. J.—Mayor John J. Todd and Clerk Henry F. Dempsey have been authorized to sign with Madison Construction Company for building of storm water drain in DeHart St. from McCullough Ave. to Maple Ave. Price to be paid is $437.50, which includes constructing of two catch-basins.

Westfield, N. J.—To E. W. Chamberlain, contract to build sewers in Newark Ave. and Graceland Pl.

Bucyrus, O.—To Martin Teynor, Bucyrus, at $14,187, to include 9,800 ft. 10 to 33-in., 1,275 ft. 24-in. and 200 ft. 12-in. pipe sewer. Other bidders: C. E. Kimbrough Co., New Castle, Pa., $17,389; Ames Bros., Columbus, $16,864; Shepard & Hinkle, Ashland, $15,771. F. L. Niederheiser is City Engr.

Springfield, O.—Martin & Stewart on their bid of $21,182.71, have been awarded contract for construction of Pearl St. Tibbetts Ave. sewer system and Philip Hounker was given job of constructing sewer in alley west of Lagonda Ave. His bid was $2,002.01.

Altoona, Pa.—Official notice has been given by Director F. E. Rooney, of department of streets and public improvements, to contracting firms of D. C. Serber, Inc., and James Ferry & Sons, of confirmation of their respective contracts for construction of sewage disposal plant and outfall sewer.

West Chester, Pa.—To Cantrell Construction Co. of Philadelphia, at $12,743, for completion of new sewer system.

Racine, Wis.—Contract for putting sewers in 18th and 19th Sts. and Grange Ave. has been awarded to Fritz Reichert.

WATER SUPPLY

Montague, Cal.—City Trustees have sold entire issue of $25,000 of municipal water bonds to V. E. Warrens.

Hartford, Conn.—Proposition from Board of Finance has been received by Board of Water Commissioners and referred to water board's finance committee for consideration. Under proposition issue of $2,000,000 bonds is provided for in ten series, first of which will mature sixteen years from date of issue, and last thirty years, making $200,000 maturing yearly.

Leavenworth, Kan.—A modern filter and up-to-date water system for state penitentiary at Lansing was decision made by State Board of Corrections.

Hancock, Md.—Bonds in sum of $30,000 have been voted for waterworks.

Boston, Mass.—See "Streets & Roads."

New Bedford, Mass.—Petitions have been received for extension of water mains.

North Adams, Mass.—Erection of reservoir is recommended.

Three Forks, Mont.—Election will be held April 23 for voting on $45,000 worth of bonds for municipally owned water works plant and sewer system.

Buffalo, N. Y.—Committee on water has decided to report favorably on request from Colonel Ward for $400,000 bond issue for completion of waterworks system. Money will be spent as follows: Construction of pumping station, $100,000; treatment plant and valve and meter house, $100,000; extension of mains from waterworks to city system, $100,000; extension of mains to towers on Doat and Dole Sts., $100,000. Colonel Ward has told committee that $200,000 in addition to amounts mentioned will be needed for completion of waterworks system.

Winston-Salem, N. C.—Election will be held for voting on $50,000 bond issue for water works and extension of mains.

Bowling Green, O.—Wood County commissioners and trustees of Ross township are discussing petition of Rossford citizens for extension of Toledo city water mains to that town.

Dayton, O.—Service Director Barlow has sent out requests for bids for meters, which will be used in connection with operation of water department during year. Appropriation of $9,750 was made for this purpose. Bids will be opened in about ten days. Rubber drains are included in specifications

East Youngstown, O.—Whether village shall continue with present water supply as furnished by Mahoning Valley Water Co., or shall erect stand pipe, install "booster" or buy water from city of Youngstown is being discussed.

Hamilton, O.—Ordinance has been introduced authorizing and directing Service Director to contract for furnishing and laying of approximately 2,500 lin. ft. of 16-in. cast iron water pipe on Sycamore St. at approximate cost not to exceed $10,000 in connection with municipal water works and as emergency measure necessary for preservation of public health, safety and welfare.

Toledo, O.—City will spend about $400,000 this summer on waterworks department. The outlay is for installation of high pressure pumping station and for construction of 24-in. submarine under Maumee river to East Side in addition to making a 30-in. Main belt around chief business and residential sections of city.

Coquille, Ore.—City Council has passed ordinances for rebuilding about 23,300 ft. of water pipe line, 6, 8, and 10-in. pipe.

Eugene, Ore.—The $100,000 water extension bonds of city will soon be accepted by bond buyers and money will be forthcoming in very short time, so that extensions and improvements to water system of city may proceed early next month.

Milton, Ore.—Citizens have voted in favor of $18,000 bond issue for water works extensions, and for improving power plant.

Altoona, Pa.—Bids will shortly be advertised for construction of new reservoir on Prospect Hill.

Barnesboro, Pa.—Definite arrangements for installation of municipal water plant in Barnesboro will be made at special meeting of Barnesboro Council.

Tamaqua, Pa.—Tamaqua Water Commission has decided to ask Council's permission to issue bonds to amount of $100,000 for new reservoir and other improvements to town's water supply.

Westerly, R. I.—Extension of water system to Weekapaug at cost of $15,000 will be voted on.

Yankton, S. D.—Election will be held on April 21 for voting $60,000 bond issue for equipping and extending municipal waterworks system.

Ashland, Va.—Construction of proposed water works and sewer system is in charge of E. M. Hastings, Chmn. Water Comrs. Cost, $40,000. Henry G. Ellis is Mayor.

Wheeling, W. Va.—It is very likely that question of filtration for Wheeling will be submitted to vote of people during latter part of May or first of June.

Centralia, Wash.—City Commission will shortly award contract for building of new reservoir to be constructed for local gravity water system. Bids were opened by City Commission, but three of those submitted were so nearly equal that decision will not be made for a week. Three bids that will be considered are those of Harbor Paving Co., of Aberdeen; Henning & McMullen, of Tacoma, and A. Walin, of Aberdeen. Lowest bid submitted was under $20,000.

Seattle, Wash.—All bids on contract for laying water mains in 13th Ave. S. have been rejected by Board of Public Works, and superintendent of water has been directed to proceed with work of laying mains as proposed by him in his agreement to do work for $3,545.40.

Lake Mills, Wis.—City has been ordered by state railroad commission to extend water mains on certain streets.

Seaside, Ont.—Taxpayers have authorized $42,000 appropriation for water works.

CONTRACTS AWARDED.

Laporte, Ind.—Contracts have been awarded by board of public works for installation of new pump at Kankakee pumping station, and for iron pipe and fittings for waterworks department. Contract for pump went to Hill-Tripp Pump Co. of Anderson, Ind., price being $520. James B. Clow Co. of Chicago received contract for furnishing six-inch water pipe, price being $25.25 a ton. Next lowest bid was $25.25 a ton. Contract for brass and fittings went to Illinois Malleable Iron Works of Chicago.

Laporte, Ind.—To Frank King, of Laporte for digging, backfilling water trenches for water works department, at following prices: Excavating and backfilling dirt streets, puddling, 16¼ cts. per line. ft.; excavating and backfilling trenches on dirt streets, tamping, 24¼ cts. per lin. ft.; excavating and backfilling on macadam streets, 29 cts. per lin. ft.; same on brick streets, 33 cts. per lin. ft.